KUMARAGURUCOLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.E., MECHANICAL ENGINEERING

REGULATIONS 2018

CURRICULUM AND SYLLABI

I to IV Semesters

Department of Mechanical Engineering

Approved by BoS Chairman

VISION

To emerge as a center that imparts quality higher education through its program in the domain of Mechanical Engineering to meet the changing needs of the society

MISSION

The department involves in sustained curricular and co-curricular activities with competentfaculty through teaching and research that generates technically capable Mechanical Engineering professionals to serve the society with delight and gratification.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of Mechanical Engineering Undergraduate Program are to prepare the students:

I. Graduates will take up careers in manufacturing and design related sectors.

II. Graduates will be involved in the execution of mechanical engineering projects.

III. Graduates will take up educational programmes in mastering mechanical engineering science and management.

PROGRAM OUTCOMES (POs)

Graduates of the Mechanical Engineering Undergraduate Program should have the ability to:

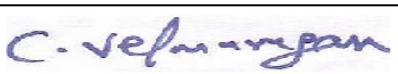
PO 1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.



Approved by BoS Chairman

PO 6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

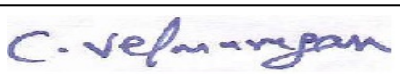
PO 12: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of the Mechanical Engineering Undergraduate Program will have the ability to:

PSO 1: Apply the fundamentals of engineering and mathematics to solve complex problems in the field of design and thermal sciences.

PSO 2: Apply the concepts of production planning and industrial engineering techniques in the field of manufacturing engineering.



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KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE – 641 049

REGULATIONS 2018

B.E. MECHANICAL ENGINEERING

Semester I										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ENI1201	Fundamentals of Communication -I	Embedded - Theory & Lab	HS	2	0	2	0	3	--
2	U18MAI1201	Linear Algebra and Calculus	Embedded - Theory & Lab	BS	3	0	2	0	4	--
3	U18CHT1201	Engineering Chemistry	Embedded - Theory & Lab	BS	3	0	2	0	4	--
4	U18MEI1201	Engineering Graphics	Embedded - Theory & Lab	ES	2	0	2	0	3	--
5	U18CSI1201	Problem Solving and Programming using C	Embedded - Theory & Lab	ES	3	0	2	0	4	--
6	U18INI1600	Engineering Clinic I	Project based course	ES	0	0	4	2	3	--
7	U18MEP1502	Engineering Practices Laboratory	Lab	ES	0	0	2	0	1	--
8	U18VEP1501	PERSONAL VALUES (Mandatory)	Practical course	HE	0	0	2	0	0	--
								Total Credits	**22**	
								Total Contact Hours/week	**31**	

Semester II										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18ENI2201	Fundamentals of Communication-II	Embedded - Theory & Lab	HS	2	0	2	0	3	U18ENI1201
2	U18MAI2201	Advanced Calculus and Laplace Transform	Embedded - Theory & Lab	BS	3	0	2	0	4	U18MAI1101
3	U18PHI2201	Engineering Physics	Embedded - Theory & Lab	BS	3	0	2	0	4	--
4	U18CSI2201	Python Programming	Embedded - Theory & Lab	ES	2	0	2	0	3	--
5	U18MET2001	Manufacturing Technology	Theory	PC	3	0	0	0	3	--
6	U18MEP2502	Manufacturing and Metallurgy Laboratory	Lab	PC	0	0	2	0	1	--
7	U18INI2600	Engineering Clinic II	Project based course	ES	0	0	4	2	3	--
8	U18VEP2502	INTERPERSONAL VALUES (Mandatory)	Practical course	HE	0	0	2	0	0	--

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Total Credits	**21**	
Total Contact Hours/week	**30**	

Semester III										**Pre-requisite**
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAT3101	Partial differential equations and transforms	Theory	BS	3	1	0	0	4	--
2	U18MEI3201	Metal Cutting and Computer Aided Manufacturing	Embedded-Theory & Lab	PC	3	0	2	0	4	--
3	U18MET3002	Engineering Mechanics	Theory	ES	3	0	0	0	3	--
4	U18MET3003	Engineering Thermodynamics	Theory	PC	3	0	0	0	3	--
5	U18MET3004	Computer aided design	Theory	ES	3	0	0	0	3	--
6	U18MEI3205	Machine drawing	Embedded Theory and Practical	PC	2	0	2	0	3	--
7	U18INI3600	Engineering Clinic III	Project based course	ES	0	0	4	2	3	--
8	U18VEP3503	FAMILY VALUES (Mandatory)	Practical course	HE	0	0	2	0	0	--
Total Credits									**23**	
Total Contact Hours/week									**28**	

Semester IV										**Pre-requisite**
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAT4101	Numerical Methods and Probability	Theory	BS	3	1	0	0	4	--
2	U18MEI4201	Strength of Materials	Embedded - Theory & Lab	PC	3	0	2	0	4	U18MET3001
3	U18MEI4202	Fluid Mechanics and Machinery	Embedded - Theory & Lab	PC	3	0	2	0	4	--
4	U18MET4003	Kinematics of Machinery	Theory	PC	3	0	0	0	3	U18MET3003
5	U18INI4600	Engineering Clinic IV	Project based course	ES	0	0	4	2	3	--
6	U18CHT4003	Environmental Science and Engineering	Theory	MC	3	0	0	0	0	--
7	U18EEI4207	Electrical Drives and Control	Embedded - Theory & Lab	ES	3	0	2	0	4	--
8	U18VEP4504	PROFESSIONAL VALUES (Mandatory)	Practical course	HE	0	0	2	0	0	--
Total Credits									**22**	
Total Contact Hours/week									**31**	

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SEMESTER I

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U18ENI1201FUNDAMENTALS OF COMMUNICATION -I
(Common to all branches of Engineering and Technology)

L	T	P	J	C
2	0	2	0	3

Course outcomes:

At the end of this course, the student will be able to:
CO1: Understand and use Grammar and Vocabulary with accuracy and clarity.
CO2: Communicate effectively in various situations.
CO3: Read and Comprehend language.
CO4: Develop Writing skills.
CO5: Disseminate professional information through appropriate means of communication.

Pre-requisites: Nil

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak														
COs	**PROGRAMME OUTCOMES (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	M												
CO2	S	M												
CO3	S	L			L				L	L				
CO4	M	L			L				L	L		M		
CO5	M	L			L				L	L		M		
CO6	L	L												

COURSE ASSESSMENT METHODS

DIRECT
Assessments (5Hours) 1. Listening Comprehension - A Film 2. Speaking 3. Conversation among few people 4. Grammar Presentations 5. Written Exercises 6. Class room tests
INDIRECT
1. Course-end survey

Applied Grammar and Vocabulary **14 Hours**

1.1 Verb and Adverb	2Hours
1.2 Subject Verb Agreement	2Hours
1.3 Adjectives and its types	2Hours
1.4 Articles, Gerunds, Infinitives and Prepositions	2Hours
1.5 Tenses	2Hours
1.6 Clauses	3Hours

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1.7 Question tags 1hours

READING **3 Hours**

2.1 Skimming and Scanning using newspapers
2.2 Reading Comprehension and Cloze test
2.3 Summarizing and note-taking.

LISTENING COMPREHENSION **3 hours**

6 audios

SPEAKING **10 Hours**

4.1 Speak up
4.2 Narration
4.3 Presentations (Grammar)
4.4 Reading aloud

PRINCIPLES OF WRITING **10 Hours**

5.1 Be Forms
5.2 Sentence Patterns
5.3 Kinds of Sentences
5.4 Writing a Paragraph
5.5 Writing an Essay – Open Essay

Theory: 0	Tutorial: 0	Practical: 40	Project: 0	Total: 40 Hours

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U18MAI1201 **LINEAR ALGEBRA AND CALCULUS**
(Common to All branches – 2018 batch only)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

CO1: Identify eigenvalues and eigenvectors and apply Cayley Hamilton theorem.
CO2: Apply orthogonal diagonalisation to convert quadratic form to canonical form.
CO3: Solve first order ordinary differential equations and apply them to certain physical situations.
CO4: Solve higher order ordinary differential equations.
CO5: Evaluate the total derivative of a function, expand the given function as series and locate the maximum and minimum for multivariate function.
CO6: Determine Rank, Inverse, Eigenvalues, Eigenvectors of the given matrix, Maxima-Minima of the function and Solving Differential equations using MATLAB

Pre-requisite: Basics of Matrices, Differentiation and Integration

CO/PO Mapping
S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S			M				M	M		M		
CO2	S	S			M				M	M		M		
CO3	S	S			M				M	M		M		
CO4	S	S			M				M	M		M		
CO5	S	S			M				M	M		M		
CO6	S	S			M				M	M		M		

Course Assessment methods:

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test; Cooperative Learning Report, Assignment; Journal Paper Review, Group Presentation, Project Report, Poster Preparation, Prototype or Product
3. Demonstration etc (as applicable) (Theory component)
4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component)
5. Model Examination (lab component)
6. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

THEORY COMPONENT

MATRICES **6 Hours**

Rank of a matrix – Consistency of a system of linear equations - Rouche's theorem - Solution of a system of linear equations - Linearly dependent and independent vectors– Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley Hamilton theorem (excluding proof)

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DIAGONALISATION OF A REAL SYMMETRIC MATRIX **6 Hours**

Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS **11 Hours**

Leibnitz's equation – Bernoulli's equation – Equations of first order and higher degree - Clairauts form – Applications: Orthogonal trajectories.

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS **11 Hours**

Linear equations of second and higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Applications.

FUNCTIONS OF SEVERAL VARIABLES **11 Hours**

Total derivative – Taylor's series expansion – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total : 45 Hours**

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Kreyzig E., "Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons, 2011.
4. Veerarajan T., Engineering Mathematics (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007
5. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2008
6. Venkataraman M.K., "Engineering Mathematics", The National Pub. Co., Chennai,2003
7. Weir, MD, Hass J, Giordano FR: Thomas' Calculus, Pearson education 12th Edition, 2015
8. P.Bali., Dr. Manish Goyal., Transforms and partial Differential equations, University Science Press, New Delhi, 2010
9. G.B.Thomas and R.L.Finney, Calculus and analytical geometry, 11th Edition, PearsonEducation, (2006)

LAB COMPONENT **30 Hours**

List of MATLAB Programmes:

1. Introduction to MATLAB.
2. Matrix Operations - Addition, Multiplication, Transpose, Inverse
3. Rank of a matrix and solution of a system of linear equations
4. Characteristic equation of a Matrix and Cayley-Hamilton Theorem.

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5. Eigenvalues and Eigenvectors of Higher Order Matrices
6. Curve tracing
7. Solving first order ordinary differential equations.
8. Solving second order ordinary differential equations.
9. Determining Maxima and Minima of a function of one variable.
10. Determining Maxima and Minima of a function of two variables.

Theory: 45 Tutorial: 0 Practical: 30 Project: 0 Total: 75 Hours

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U18CHT1201ENGINEERING CHEMISTRY

(Common to AE, AUE, CE, MCE, ME, ECE, EEE)

L	T	P	J	C
3	0	2	0	4

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Apply the basic principles of chemistry at the atomic and molecular level.

CO2: Analyze the impact of engineering solutions from the point of view of chemical principles

CO3: Apply the chemical properties to categorize the engineering materials and their uses

CO4: Integrate the chemical principles in the projects undertaken in field of engineering and technology

CO5: Develop analytical proficiency through lab skill sets to demonstrate in professional practice.

Pre-requisites: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	ProgrammeOutcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M													
CO2	S		M		M									
CO3	S	M												
CO4	S			M					S		W			
CO5	S					M			S	W				

Course assessment methods

DIRECT
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group 3. Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable) 4. End Semester Examination
INDIRECT
1. Course-end survey

CHEMICAL BONDING **7 Hours**

Bonding: Introduction – Ionic bonding - Van der Waal's forces (dipole - dipole, dipole - induced dipole, induced dipole - induced dipole interactions) - hydrophobic interaction.

Bonding in organic molecules: covalent and co-ordinate bonds (overview only) - hybridization (sp, sp2, sp3) - hydrogen bonding and its consequences.

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THERMODYNAMICS **7 Hours**

Introduction - Thermodynamic process – Internal energy – Enthalpy – limitations of First law of thermodynamics – Second law of thermodynamics - Entropy - Third law of thermodynamics – Free Energy and Work Function – Clausius-Clapeyron equation – Maxwell's relations – Kirchhoff's equation.

ELECTROCHEMISTRY AND CORROSION **7 Hours**

Electrodes - Electrode Potential – Nernst equation and problems - Galvanic cell - Electrochemical Series.

Corrosion: Classification and mechanism of chemical and electrochemical corrosion - Factors influencing corrosion

Corrosion control: Inhibitors – Cathodic protection (Sacrificial anodic protection, Impressed current cathodic protection) – Protective coating: Electroplating (Au) and Electroless plating (Ni).

WATER TECHNOLOGY **7 Hours**

Introduction - soft/hard water - Disadvantages of hard water in industries– scale, sludge, priming and foaming, caustic embrittlement.

Treatment of hard water: External treatment (Ion exchange method) - Internal treatment (colloidal, carbonate, phosphate and calgon conditioning) - Desalination (Reverse osmosis, Electrodialysis)

ENGINEERING MATERIALS **7 Hours**

Polymer: Introduction – Preparation, Properties and Applications of PMMA, PET, PVC.

Composites: Constituents of Composites – Polymer Composites - Metal Matrix Composites - Ceramic Matrix Composites – Applications

Lubricants: Classification - Functions - Properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud point and pour point) - Semi solid lubricant (greases with calcium based, sodium based, lithium based) - Solid lubricants (graphite, molybdenum disulphide)

SURFACE CHEMISTRY AND CATALYSIS **7 Hours**

Adsorption: Types of adsorption – Adsorption isotherms: Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – Applications of adsorption on pollution abatement.

Catalysis: Catalyst – catalytic poisoning and catalytic promoters - autocatalysis –- acid base catalysis – enzyme catalysis – Michaelis-Menten equation – applications.

Chemical kinetics: Introduction – first order, pseudo first order, second order, zero order equations – parallel reactions – opposing reactions.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total : 45 Hours**

Approved by BoS Chairman

REFERENCES

1. Jain P.C. and Jain. M., Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, Reprint 2017.
2. Puri B.R., Sharma L.R., Pathania, M.S. Principles of physical chemistry, Vishal Publishing Co., 2017
3. Atkins, P. and de Paula, J., Atkin's Physical Chemistry, 9th ed., Oxford Univ. Press, 2009.
4. Glasstone S., An introduction to Electrochemistry, 10th Edition, Affiliated to East West Press Private Limited, 2007.
5. Samir Sarkar., Fuels and Combustion, 3rd Edition, Orient Longman, India, 2009.
6. Dara S.S. and Umare S.S., A text book of Engineering Chemistry, S.Chand and Company Limited, New Delhi, 2014.
7. Engineering Chemistry, Wiley India Editorial Team, Wiley, 2018.

LABORATORY COMPONENT

LIST OF EXPERIMENTS

1. Preparation of Standard solutions
2. Conductometric estimation of mixture of acids vs strong base
3. Estimation of extent of corrosion of Iron pieces by Potentiometry
4. Estimation of the extent of dissolution of Copper / Ferrous ions by spectrophotometry.
5. Estimation of acids by pH metry.
6. Determination of total, temporary and permanent hardness by EDTA method.
7. Estimation of DO by Winkler's method
8. Estimation of Alkalinity by Indicator method.
9. Estimation of Chloride by Argentometric method
10. Estimation of Sodium and Potassium in water by Flame photometry.
11. Determination of Flash and Fire point of lubricating oil
12. Determination of Cloud and Pour point of lubricating oil
13. Determination of relative and kinematic viscosities of lubricating oil at different temperatures
14. Determination of corrosion rate on mild steel by Weight loss method
15. Morphological studies of corrosion on mild steel by microscopic techniques

Theory: 0	Tutorial: 0	Practical:30	Project: 0	Total : 30 Hours

REFERENCES

1. Jeffery G.H., Bassett J., Mendham J. and Denny R.C., Vogel's Text Book of Quantitative Chemical Analysis, Oxford, ELBS, London,2012.
2. Shoemaker D.P. and C.W. Garland., Experiments in Physical Chemistry, Tata McGraw-Hill Pub. Co., Ltd., London,2003.

Approved by BoS Chairman

U18MEI1201 ENGINEERING GRAPHICS

(Common to AE, AUE, CE, MCE, ME, ECE, EEE and TXT)

L	T	P	J	C
2	0	2	0	3

Course outcome

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

CO1: Construct various plane curves.

CO2: Construct projection of points and projection of lines.

CO3: Develop projection of surfaces and solids.

CO4: Solve problems in sections of solids and development of surfaces.

CO5: Apply free hand sketching and concepts of isometric in engineering practice.

CO6: Draw engineering drawing in AutoCAD with dimensions.

Pre-requisites: Nil

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	ProgrammeOutcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	M												
CO2	S	S									W			
CO3	S	S									M			
CO4	S	S												
CO5	S	S												
CO6	S													

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test, Assignment, Group Presentation 3. Viva, Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) 5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

PLANE CURVES, PROJECTION OF POINTS, LINES AND PLANES 10Hours

Importance of graphics in design process, visualization, communication, documentation and drafting tools, Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only. Orthographic projection of points.

Projections of straight lines located in first quadrant - determination of true length and true inclinations.

Projections of plane surfaces - polygonal lamina and circular lamina, located in first quadrant and inclined to one reference plane.

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PROJECTION AND SECTION OF SOLIDS **10Hours**

Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane.

Sectioning of simple solids - prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.

DEVELOPMENT OF SURFACES, ISOMETRIC PROJECTIONS AND FREE-HAND SKETCHING **10Hours**

Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

Isometric projection, Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.

Free hand sketching techniques, sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning.

PRACTICALS

INTRODUCTION TO AUTOCAD **15Hours**

Introduction to Drafting Software (AutoCAD) & its Basic Commands. Introduction to coordinate systems, object selection methods, selection of units and precession. sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer.

ISOMETRIC VIEWS WITH AUTOCAD **15Hours**

Building drawings – Single and double bed room house (sectional Top view only). Introduction to Motion path animation. Isometric views of simple solid blocks.

Theory: 30	**Tutorial: 0**	**Practical:30**	**Project: 0**	**Total :60 Hours**

REFERENCES

1. Basant Agrawal and CM Agrawal, Engineering Drawing, McGraw-Hill, New Delhi, First Edition, 2008.
2. Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, New Delhi, 2008.
3. Nataraajan K.V., Engineering Drawing and Graphics, Dhanalakshmi Publisher, Chennai, 2005.
4. Warren J. Luzadder and Jon. M. Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., New Delhi, Eleventh Edition, 2005.
5. Gopalakirishna K.R., Engineering Drawing (Vol. I & II), Subhas Publications, 2001.
6. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.

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U18CSI1201PROBLEM SOLVING ANDPROGRAMMING USING C

L	T	P	J	C
3	0	2	0	4

Course outcomes

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO

CO1: Develop simple Python program in interactive and script mode.

CO2: Solve problems using control statements in Python

CO3: Construct Python programs using functions and strings.

CO4: Make use of Python lists, set, tuples, dictionaries to represent compound data.

CO5: Build Python Programs to read and write data from/to files.

CO6: Develop python programs to handle exceptions.

Pre-requisites: Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	M		M				M	M		M		
CO2	S	S	M		M				M	M		M		
CO3	S	S	M		M				M	M		M		
CO4	S	S	M		M				M	M		M		
CO5	S	S	M		M				M	M		M		
CO6	S	S	M		M				M	M		M		

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open Book Test, Assignment, Group Presentation
3. Viva, Experimental Report for each Experiment (lab Component)
4. Model Examination (lab component)
5. End Semester Examination (Theory and lab components)

INDIRECT

1. Course-end survey

STRUCTURED PROGRAMMING **9 Hours**

Algorithms, building blocks of algorithms (instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving.

ARRAYS AND STRINGS **9 Hours**

Introduction to C Programming – Operators and Expressions – Data Input and Output – Control Statements. Defining an array – Processing an array – Passing arrays to functions – Multidimensional Arrays Character Arithmetic – Defining a string – NULL character – Initialization of Strings – Reading and Writing Strings – Processing Strings –Searching and Sorting of Strings.

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FUNCTIONS, STORAGE CLASSES **9 Hours**

Defining a function – Accessing a function – Function prototypes – Passing arguments to a function – Function with string - Recursion – Storage classes

POINTERS **9 Hours**

Pointer Fundamentals – Pointer Declaration – Passing Pointers to a Function – Pointers and one dimensional arrays – operations on pointers– Dynamic memory allocation

STRUCTURES, UNIONS AND FILES **9 Hours**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types (Typedef) – Unions
Files: Opening and Closing a Data File – Reading and writing a data file – Processing a data file – Unformatted data files – Concept of binary files – Accessing a file randomly using fseek

Theory: 45 Tutorial: 0 Practical: 0 Project: 0 Total: 45 Hours

REFERENCES

1. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
2. PradipDey and ManasGhosh, "Programming in C", Second Edition, Oxford University Press, 2011.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
5. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
6. PradipDey and ManasGhosh, "Programming in C", Second Edition, Oxford University Press, 2011.
7. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
8. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.

LAB COMPONENT CONTENTS

LIST OF EXPERIMENTS **30 Hours**

1. Writing algorithms, flowcharts and pseudo codes for simple problems.
2. Programs on expressions and conversions
3. Programs using if, if-else, switch and nested if statements
4. Programs using while, do-while, for loops
5. Programs on one dimensional arrays, passing arrays to functions and array operations
6. Programs using two dimensional arrays, passing 2D arrays to functions
7. Programs using String functions
8. Programs using function calls, recursion, call by value

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9. Programs on pointer operators, call by reference, pointers with arrays
10. Programs using structures and unions.
11. Programs on file operations and modes.
12. Working with text files, random files and binary files

Theory: 0 Tutorial: 0 Practical: 30 Project: 0 Total: 30 Hours

REFERENCES

1. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
2. PradipDey and ManasGhosh, "Programming in C", Second Edition, Oxford University Press, 2011.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.

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U18INI1600 **ENGINEERING CLINIC - I**

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:

CO1: Identify a practical problem and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

Nil

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													
COs	ProgrammeOutcomes(POs)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1. Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the First semester, students will focus primarily on IOT with C programming using Audino

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GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific task, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U18MEP1502 ENGINEERING PRACTICES LABORATORY

(Common to all branches of Engineering and Technology (Except CSE and IT))

L	T	P	J	C
0	0	2	0	1

Course outcomes

At the end of this course, the student will be able to:

CO1: Understand the applications of simple tools used in the fabrication workshop.

CO2: Select the appropriate tools required for specific operation.

CO3: Make simple joints using Carpentry and Fitting tools also make simple components using sheet metal tools.

CO4: Understand the applications of different plumbing tools and fittings.

CO5: Demonstrate and evaluate the parameters of basic electronic components (wires, resistors, capacitors, diodes etc.) and test the components.

CO6: Estimate DC and AC Voltage and currents using appropriate measuring instruments.

Pre-requisites: Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			W					M		M				
CO2			W					M		M				
CO3			W					M		M				
CO4			W					M		M				
CO5			W					M		M				
CO6			W					M		M				

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test, Assignment, Group Presentation 3. Viva, Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) 5. End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

LIST OF EXPERIMENTS

GROUP – I

A. CIVIL ENGINEERING

1. Carpentry
   - Study of carpentry tools
   - Preparation of T joint
   - Preparation of dovetail joint

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2. Plumbing
    - Study of pipeline joints

B. MECHANICAL ENGINEERING

1. Fitting
    - Study of fitting tools
    - Preparation of L joint
2. Sheet Metal Working
    - Study of sheet metal working tools
    - Preparation of Tray
    - Preparation of Cone
3. Demonstration of mold preparation
4. Demonstration of smithy operations
5. Demonstration of SMA welding process

GROUP - II (ELECTRICAL & ELECTRONICS ENGINEERING)

C. ELECTRICAL ENGINEERING PRACTICE

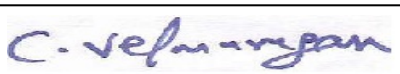
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair-case wiring.
4. Measurement of electrical quantities–voltage, current, power & Power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.

D. ELECTRONIC ENGINEERING PRACTICE

1. Assembling simple electronic component on a small PCB and Testing.
2. Soldering simple electronic circuits and checking continuity.
3. Measurements using digital multimeter.
    - DC and AC voltage measurement
    - DC and AC current measurements.
    - Resistance Measurement.
    - Continuity measurement.

1. Testing of Electronic components
    - Resistors
    - Inductors and capacitors
    - Diodes (resistance in forward bias and reverse bias)
    - Transistors
2. Study of CRO and Function generator
    - Study of Panel Controls
    - Measurement of Amplitude, Frequency, phase difference

Theory: 0	Tutorial: 0	Practical: 45	Project: 0	Total: 45 Hours



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U18VEP1501 **PERSONAL VALUES**
(Mandatory)

L	T	P	J	C
0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Become an individual in knowing the self

CO 2: Acquire and express Gratitude, Truthfulness, Punctuality, Cleanliness & fitness.

CO 3: Practice simple physical exercise and breathing techniques

CO 4: Practice Yoga asana which will enhance the quality of life.

CO 5: Practice Meditation and get benefited.

CO 6: Procure Self-Healing techniques for propagating healthy society

Pre-requisites: NIL

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	ProgrammeOutcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												M
CO2										S		
CO3						M						
CO4						S			M			
CO5										M		
CO6								W				S

Course Assessment methods

Direct
1. Group Activity / Individual performance and assignment 2. Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

Values through Practical activities:

1.Knowing the self: Introduction to value education - Need & importance of Value education – Knowing the self – realization of human life – animal instinct vs sixth sense.

2. **Mental Health: Evolution** of senses – functioning steps of human mind – Body and Mind coordination - Analysis of thoughts – moralization of desires– autosuggestions – power of positive affirmations. – Meditation and its benefits.

3.Physical Health: Physical body constitution– Types of food - effects of food on body and mind – healthy eating habits – food as medicine– self healing techniques.

4.Core value: Self-love & Self-care Gratitude - Happiness - Optimistic –Enthusiasm – Simplicity – Punctual - Self Control - Cleanliness & personal hygiene - Freedom from belief systems.

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5.Fitness: Simplified physical exercises – Sun salutation - Lung strengthening practices: Naadisuddhi pranayama – Silent sitting and listening to nature – Meditation.

Workshop mode

REFERENCES

1. KNOW YOURSELF — SOCRATES – PDF format at
   www.au.af.mil/au/awc/awcgate/army/rotc_self-aware.pdf

2. STEPS TO KNOWLEDGE: The Book of Inner Knowing – PDF format at
   www.newmessage.org/wp-content/uploads/pdfs/books/STK_NKL_v1.5.pdf

3. PROMOTING MENTAL HEALTH - World Health Organization – PDF format at
   www.who.int/mental_health/evidence/MH_Promotion_Book.pdf

4. LEARNING TO BE: A HOLISTIC AND INTEGRATED APPROACH TO VALUES – UNESCO PDF format at
   www.unesdoc.unesco.org/images/0012/001279/127914e.pdf

5. PERSONALITY DEVELOPMENT By SWAMI VIVEKANANDA
   www.estudantedavedanta.net/Personality-Development.pdf

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SEMESTER II

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U18ENI2201 – FUNDAMENTALS OF COMMUNICATION - II

(Common to all branches of II Semester B.E/B/Tech Programmes)

L	T	P	J	C
2	0	2	0	3

Course Objectives:

1. To effectively use the basic language skills to imbibe technical language skills.
2. To hone written and spoken competencies leading to effective communication.
3. To comprehend, use and explain technical data and information.

Course Outcomes:

After the course the student will be able to:

CO1: Read, understand, and interpret material on technology.

CO2: Communicate knowledge and information through oral and written medium.

CO3: Compare, collate and present technical information according to the audience and purpose.

Assessment Methods

Direct
1. Continuous Assessment of Skills 2. Assignment 3. Written Test 4. End Semester Examination
Indirect
1. Course-end survey

CO/PO Mapping:

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													
COs	**Programme Outcomes(POs)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1		W		S					S	S		S		
CO2				S					S	S		W		
CO3				M					S	S		S		

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No	TOPIC	
	MODULE I	**12 Hrs**
1.1	Introduction to Technical Writing Technical Definitions	2
1.2	Writing Instructions / Instruction Manual	2
1.3	Writing Recommendations	2
1.4	Speaking Activity I	6
	MODULE II	**12 Hrs**
2.1	Process Writing	2
2.2	Review Writing I - Product	2
2.3	Review Writing II – Article	2
2.4	Speaking Activity II	6
	MODULE III	**12 Hrs**
3.1	Interpreting and Transcoding Graphics	2
3.2	Types of Report / Writing a Report	2
3.3	Reading & Responding to texts	2
3.4	Speaking Activity III	6
	MODULE IV	**12 Hrs**
4.1	Drafting a project proposal	2
4.2	Listening to technical talks	2
4.3	Preparing a survey Questionnaire	2
4.4	Speaking Activity IV	6
	MODULE V	**12 Hrs**
5.1	Writing Memos, Circulars, Notices	2
5.2	Writing Agenda and Minutes	2
5.3	Inferential Reading	2
5.4	Speaking Activity V	6
	Total	**60**

Reference Books:

1. Technical English Workbook, VRB Publishers Pvt. Ltd (Prof. Jewelcy Jawahar, Dr.P.Ratna)

2. Effective Technical Communication, Tata McGraw Hills Publications (Ashraf Rizvi)
3. Technical Communication – English Skills for Engineers, Oxford Higher Education (Meenakshi Raman, Sangeeta Sharma)

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U18MAI2201 ADVANCED CALCULUS AND LAPLACETRANSFORMS

(Common to All branches)

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES

After successful completion of this course, the students should be able to

CO1: Evaluate double and triple integrals in Cartesian coordinates and apply them to calculate area and volume.

CO2: Apply various integral theorems for solving engineering problems involving cubes and rectangular parallelepipeds.

CO3: Construct analytic functions of complex variables and transform functions from z-plane to w-plane and vice-versa, using conformal mappings.

CO4: Apply the techniques of complex integration to evaluate real and complex integrals over suitable closed paths or contours.

CO5: Solve linear differential equations using Laplace transform technique.

CO6: Determine multiple integrals, vector differentials, vector integrals and Laplace transforms using MATLAB.

Pre-requisites: Nil

CO/PO MAPPING

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S			M				M	M		M		
CO2	S	S			M				M	M		M		
CO3	S	S			M				M	M		M		
CO4	S	S			M				M	M		M		
CO5	S	S			M				M	M		M		
CO6	S	S			M				M	M		M		

COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test I, II (Theory component)
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) (Theory component)
3. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component)
4. Model examination (lab component)

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5. End Semester Examination (Theory and lab component)
INDIRECT
1. Course-end survey

THEORY COMPONENT

MULTIPLE INTEGRALS **9 Hours**

Double integration – Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Applications: Area as double integral and Volume as triple integral.

VECTOR CALCULUS **9 Hours**

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Verification of theorem and simple applications.

ANALYTIC FUNCTIONS **9 Hours**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy- Riemann equations in Cartesian coordinates and sufficient conditions (excluding proofs)– Properties of analytic function – Construction of analytic function by Milne Thomson method – Conformal mapping :$w = z + c$, cz , $1/z$ – Bilinear Transformation

COMPLEX INTEGRATION **9 Hours**

Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series – Singularities –Residues –Residue theorem –Application of residue theorem for evaluation of real integrals – Contour Integration (excluding poles on the real axis).

LAPLACE TRANSFORMS **9 Hours**

Definition - Properties: Superposition, Shift in t or Time Delay, Shift in s, Time Derivatives, Time Integral-Initial Value Theorem - Final Value Theorem - Transform of periodic functions - Inverse transforms - Convolution theorem – Applications: Solution of linear ordinary differential equations of second order with constant coefficients.

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.
3. Veerarajan T., Engineering Mathematics (for First Year), Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2007.
4. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2008.
5. Kreyzig E., "Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons, 2011.
6. Venkataraman M.K., "Engineering Mathematics", The National Pub. Co., Chennai, 2003.
7. Weir, MD, Hass J, Giordano FR: Thomas' Calculus Pearson education 12th ED, 2015.

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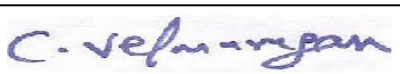
LAB COMPONENT **30 Hours**

List of MATLAB Programmes:

1. Evaluating double integral with constant and variable limits.
2. Area as double integral
3. Evaluating triple integral with constant and variable limits
4. Volume as triple integral
5. Evaluating gradient, divergence and curl
6. Evaluating line integrals and work done
7. Verifying Green's theorem in the plane
8. Evaluating Laplace transforms and inverse Laplace transforms of functions including impulse.
9. Heaviside functions and applying convolution.
10. Applying the technique of Laplace transform to solve differential equations.

Theory: 45 **Tutorial: 0** **Practical: 30** **Project: 0** **Total: 75 Hours**



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U18 PHI2201 **Engineering Physics**

(Common to AU, ECE, CE, MEC, ME)

L	T	P	J	C
3	0	2	0	4

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand the principles of motion and rotation of a rigid body in the plane.

CO2: Enhance the fundamental knowledge in properties of matter and its applications relevant to various streams of engineering and technology.

CO3: To introduce the phenomenon of heat and account for the consequence of heat transfer in engineering systems.

CO4: To apply the concepts of electrostatics and dielectrics for various engineering applications.

CO5: To understand the basics of magnetostatics.

CO6: To introduce and provide a broad view of the smart materials and Nano science to undergraduates.

Pre-requisites:

High School Education

CO PO Mapping

CO/PO MAPPING (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak														
COs	Programme Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S		M									M	M	
CO2	S		M									M	M	
CO3	S		M									M	M	
CO4	S		M									M		M
CO5	S		M									M		M
CO6	S		M	M								M		M

Course Assessment methods

Direct
1. Continuous Assessment Test I, II (Theory component)
2. Cooperative learning report, Assignment; Group Presentation, Project report, Poster preparation,

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3. Pre/Post - experiment Test/Viva; Experimental Report for each experiment (lab component) 4. Model examination (lab component) 5. End Semester Examination (Theory and lab component)
Indirect
1. Course-end survey

Theory Component contents

KINEMATICS & RIGID BODY MOTION **9 Hours**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

PROPERTIES OF MATTER **9 Hours**

Hooke's Law Stress - Strain Diagram - Elastic moduli - Relation between elastic constants - Poisson's Ratio - Expression for bending moment and depression - Cantilever - Expression for Young's modulus by Non-uniform bending and its experimental determination.

HEAT **9 Hours**

Specific heat capacity, thermal capacity. Temperature rise. Coefficient of linear thermal expansion. Methods of measurement of thermal expansion. Thermal stresses in composite structures due to non-homogeneous thermal expansion. Applications -The bimetallic strip. Expansion gaps and rollers in engineering structures. Thermal conductivity: differential equation of heat flow. Lee's disc apparatus for determination of thermal conductivity. Thermal Insulation. Convection and radiation. Applications to refrigeration and power electronic devices.

ELECTROSTATICS & MAGNETOSTATICS **9 Hours**

ELECTROSTATICS : Maxwell's equation for electrostatics – E due to straight conductors, circular loop, infinite sheet of current - electric field intensity (D) - Electric potential - dielectrics - dielectric polarization - internal field – Clasious - Mosotti equation - dielectric strength - applications.

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MAGNETOSTATICS: Maxwell's equation for magnetostatics - B in straight conductors, circular loop, infinite sheet of current - Lorentz force, magnetic field intensity (H) – Biot–Savart's Law – Ampere's Circuit Law –Magnetic flux density (B).

NEW ENGINEERING MATERIALS AND NANO TECHNOLOGY 9 Hours

New Engineering Materials: Metallic glasses – preparation, properties and applications – Shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications - advantages and disadvantages of SMA.

Nano Materials: synthesis - Ball milling - Sol-gel - Electro deposition — properties of nano particles and applications. – Carbon Nano Tubes – fabrication by Chemical Vapour Deposition - structure, properties & applications.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. Essential University Physics, Vols. 1 and 2., Richard Wolfson, Pearson Education, Singapore, 2011.
2. Engineering Mechanics (2nd ed.), Harbola M. K., Cengage publications, New Delhi, 2009.
3. Concepts of Physics, H. C. Verma vol 1 and 2, Bharati Bhawan Publishers & Distributors; First edition (2017).
4. Engineering Electromagnetics, W. H. Hayt and John A. Buck, 6th Edition, Tata McGraw Hill, New Delhi, 2014.
5. Theory and Problems of Electromagnetic Schaum's Outline Series, 5th Edition, Joseph A. Edminister, Tata McGraw Hill Inc., New Delhi, 2010.
6. Engineering Physics, Rajendran V., Tata McGraw-Hill Education Pvt. Ltd., 2010
7. Nano – the Essentials, Pradeep T., McGraw-Hill Education, Pvt. Ltd., 2007.

Lab component:

LIST OF EXPERIMENTS

1. Non-uniform bending – Determination of Young's modulus
2. Compound Pendulum – Determination of acceleration due to gravity
3. Spectrometer – Determination of wavelength of mercury source using grating

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4. Air wedge - Determination of thickness of thin sheet
5. Semiconductor Laser:
    a. Determination of wavelength of laser
    b. Determination acceptance angle and numerical aperture of an optialfibre.
    c. Determination of particle size
6. Melde's string – Determination of frequency of a turing fork
7. Determination of band gap of a semiconductor
8. Ultrasonic interferometer – Determination of velocity of sound and compressibility of a liquid
9. Luxmeter – Determination of efficiency of solar cell
10. Lee's disc – Determination of thermal conductivity of a bad conductor

Experiments for Demonstration:

1. Hall effect
2. Hardness Test
3. Four probe experiment
4. Hysteresis curve

Theory: 0	**Tutorial: 0**	**Practical: 30**	**Project: 0**	**Total: 30 Hours**

REFERENCES

1. Laboratory Manual of Engineering Physics, Dr. Y. Aparna & Dr. K. Venkateswara Rao, V.G.S Publishers.
2. Practical Physics, G.L. Squires, Cambridge University Press, Cambridge, 1985.
3. Great Experiments in Physics, M.H. Shamos, Holt, Rinehart and Winston Inc., 1959.
4. Experiments in Modern Physics, A.C. Melissinos, Academic Press, N.Y., 1966.

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U18CSI2201 **PYTHON PROGRAMMING**

(Common to All Branches)

L	T	P	J	C
2	0	2	0	3

COURSE OUTCOMES

AFTER SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENTS SHOULD BE ABLE TO:

CO1: Classify and make use of python programming elements to solve and debug simple logical problems.

CO2: Experiment with the various control statements in Python.

CO3: Develop Python programs using functions and strings.

CO4: Analyze a problem and use appropriate data structures to solve it.

CO5: Develop python programs to implement various file operations and exception handling.

Pre-requisites :Nil

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		S			M					M		M		
CO2			M							M		M		
CO3			M							M		M		M
CO4	S	S	M		M					M		M	M	M
CO5			M							M		M		

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Open Book Test, Assignment 3. Viva, Experimental Report for each Experiment (lab Component) 4. Model Examination (lab component) 5. End Semester Examination (Theory and lab components)
INDIRECT
2. Course-end survey

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THEORY COMPONENT CONTENTS

BASICS OF PYTHON PROGRAMMING **6 Hours**

Introduction-Python Interpreter-Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.

CONTROL STATEMENTS AND FUNCTIONSIN PYTHON **6 Hours**

Conditional (if), alternative (if-else), chained conditional (if-elif-else)-Iteration-while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.

DATA STRUCTURES: STRINGS, LISTS and SETS **7 Hours**

Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension, searching and sorting, Sets-creating sets, set operations.

DATA STRUCTURES: TUPLES, DICTIONARIES **5 Hours**

Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

FILES, MODULES, PACKAGES **6 Hours**

Files and Exception-Text files, reading and writing files, format Operator-Modules-Python Modules-Creating own Python Modules-packages, Introduction to exception handling.

Theory: 30	Tutorial: 0	Practical: 0	Project: 0	Total: 30 Hours

REFERENCES

1. Ashok NamdevKamthane, Amit Ashok Kamthane, “Programming and Problem Solving with Python” , Mc-Graw Hill Education,2018.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff / O’Reilly Publishers, 2016.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd,” Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
6. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus”, Wiley India Edition, 2013.

E BOOKS AND ONLINE LEARNING MATERIALS

1. www.mhhe.com/kamthane/python

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2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016
(http://greenteapress.com/wp/think-python/)

LAB COMPONENT CONTENTS **30 Hours**

LIST OF EXPERIMENTS

1. Implement simple python programs using interactive and script mode.
2. Develop python programs using id() and type() functions
3. Implement range() function in python
4. Implement various control statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, Indexing.
6. Demonstrate string functions using python.
7. Implement user defined functions using python.
8. Develop python programs to perform operations on list
9. Implement dictionary and set in python
10. Develop programs to work with Tuples.
11. Create programs to solve problems using various data structures in python.
12. Implement python program to perform file operations.
13. Implement python programs using modules and packages.

Theory: 0	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

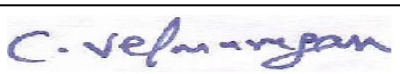
ONLINE COURSES AND VIDEO LECTURES:

http://nptel.ac.in

https://www.edx.org/course/introduction-to-python-fundamentals-1

https://www.edx.org/course/computing-in-python-ii-control-structures-0

https://www.edx.org/course?search_query=Computing+in+Python+III%3A+Data+Structures



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U18MET2001 MANUFACTURING TECHNOLOGY

L	T	P	J	C
3	0	0	0	3

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Apply the knowledge of various metal casting processes that are useful in designing system components or processes and create appropriate techniques and apply modern tools and research to model complex design and making processes of components.

CO 2: Discuss the various welding techniques with their equipment, process capabilities and principle of operations that match specific manufacturing needs with considerations for public health, safety and social issues.

CO 3: Apply the knowledge of metal working processes understanding and studying the physics behind it and focus on typical forging operations

CO 4: Identify various rolling, piercing and extrusion operations and study and make use of them in solving complex design needs through specific manufacturing tools and methods

CO 5: Understand the applications of heat treatment processes.

CO 6: Study the formability, characteristics, test methods and working principle of sheet metals by applying the knowledge of engineering and make use of sheet metal processing knowledge in practical engineering applications.

Pre-requisites: Nil

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			S		S				W	M				
CO2			S	M	S	W			W	M				
CO3	M		S						W	M				
CO4	M		S						W	M				
CO5			S		M					M				
CO6	M		S							M				

Course Assessment methods

Direct
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc (as applicable) 3. End Semester Examination
Indirect
1. Course-end survey

METAL CASTING PROCESSES **12 Hours**

Sand casting – Sand moulds - Type of patterns – Pattern materials – Pattern allowances – Types of Moulding sand – Properties – Core making – Methods of Sand testing – Moulding machines – Types of moulding machines – Working principle of Special casting processes

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– Shell, investment casting – Ceramic mould – Pressure die casting – Centrifugal casting – Sand Casting defects – Inspection methods, Runner, Riser and Gating Design, Solidification.

FABRICATION PROCESSES **10 Hours**

Fusion welding processes – Types of Gas welding – Equipment's used – Flame characteristics – Filler and Flux materials - Arc welding equipment's - Electrodes – Coating and specifications – Principles of Resistance welding – Spot/butt, seam welding – Gas cutting operations – Flux cored – Submerged arc welding – TIG welding –Weld defects – Brazing and soldering process.

METAL FORMING AND HEAT TREATMENT PROCESSES **13 Hours**

FORGING

Hot working and cold working of metals – Forging processes – Open and close die forging – Characteristics of the process – Typical forging operations.

ROLLING

Rolling of metals – Flat strip rolling – Types of Rolling mills – Shape rolling operations – Tube piercing – Defects in rolled parts.

EXTRUSION

Principles of Extrusion – Types of Extrusion – Hot and Cold extrusion.

WIRE DRAWING

Principle of rod and wire drawing.

HEAT TREATMENT

Annealing – Normalizing – Hardening – Tempering – Surface hardening processes.

SHEET METAL FORMING PROCESSES **10 Hours**

Sheet metal characteristics - Typical shearing operations, bending and drawing operations – Stretch forming operations — Formability of sheet metal – Test methods – Working principle and application of special forming processes - Hydro forming – Rubber pad forming – Metal spinning – Explosive forming – Magnetic pulse forming – Super plastic forming – Process characteristics.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES

1. HajraChoudhury, "Elements of Workshop Technology",MediaPromotorsPvt.Ltd., Mumbai, 2001.
2. SeropeKalpajian and Steven R.Schmid, "Manufacturing Engineering and Technology", Pearson Education, 2002.
3. B.S. MagendranParashar and R.K. Mittal,"Elements of Manufacturing Processes", Prentice Hall of India, New Delhi,2003.
4. P.N.Rao,"Manufacturing Technology",Tata McGraw-Hill,2002.
5. P.C. Sharma, "Production Technology", S. Chand,New Delhi,2007.

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U18MEP2502 MANUFACTURING AND METALLURGY LABORATORY

L	T	P	J	C
0	0	2	0	1

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Practice making molds using different types of patterns and core and acquire practical knowledge involved in designing prototypes/components
CO 2: Learn how to make internal geometries in castings using core
CO 3: Know and practice the skill of smithy and learn to modify the shapes of hard metal rods physically.
CO 4: Know how to perform welding operations and how to join different metals.
CO 5: Analyze the procedure of microstructure studies of various materials.
CO 6: Execute the various heat treatment process for different stages.

Pre-requisites: Nil

CO/PO MAPPING
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	PROGRAMME OUTCOMES (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			S		S				S	W	M			
CO2			S						S	W	W			
CO3					S			S	S	W	W			
CO4					S			S	S	W	W			
CO5	M			M						M		M		
CO6	M			M						M		M		

Course Assessment methods

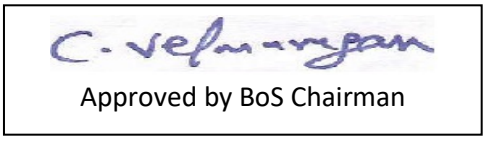
Direct
1. Pre-or Post-experiment Test/Viva; Experimental Report for each experiment; Model Examination 2. End Semester Examination
Indirect
1. Course-end survey

LIST OF EXPERIMENTS: MANUFACTURING TECHNOLOGY LABORATORY

1. Mould with solid and split patterns
2. Mould with Core
3. Conversion of round rod in to hexagonal headed square rod
4. SMAW of different types of joints

LIST OF EXPERIMENTS: METALLURGY LABORATORY

1. Study the construction and working principle of metallurgical microscope.
2. Study the procedure of specimen preparation for metallographic studies.
3. Identification of microstructure of ferrous materials, EN8 and mild steel.
4. Heat treatment comparison of



i) Unhardened specimen
ii) Quenched specimen, annealed and normalized specimen

Theory: 30	Tutorial: 0	Practical: 30	Project: 0	Total: 30 Hours

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U18INI2600 **ENGINEERING CLINIC - II**

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:

CO1: Identify a practical problem and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

1. U18INI1600 ENGINEERING CLINIC - I

CO/PO Mapping (S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak													
COs	Programme Outcomes(POs)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1. Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the second semester, students will focus primarily on Raspberry pi based controllers with Python programming.

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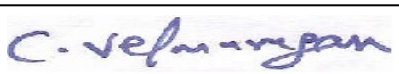
GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific task, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90



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U18VEP2502 **INTERPERSONAL VALUES**
(Mandatory)

L	T	P	J	C
0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop a healthy relationship & harmony with others
CO 2: Practice respecting every human being
CO 3: Practice to eradicate negative temperaments
CO 4: Acquire Respect, Honesty, Empathy, Forgiveness and Equality
CO 5: Practice Exercises and Meditation to lead a healthy life
CO 6: Manage the cognitive abilities of an Individual

Pre-requisites:

1. U18VEP1501 / PERSONAL VALUES

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										S		
CO2									S			
CO3											M	S
CO4						M						
CO5												M
CO6											M	

Course Assessment methods

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

Values through Practical activities:

1. Introduction: Introduction to interpersonal values – Developing harmony with others – Healthy relationship – Need & importance of interpersonal values for dealing with others and team - Effective communication with others.

2. Maneuvering the temperaments: From Greed to Contentment - Anger To Tolerance - Miserliness To Charity – Ego To Equality - Vengeance To Forgiveness.

3. Core value: **Truthfulness -**Honesty –Helping–Friendship – Brotherhood – Tolerance – Caring & Sharing – Forgiveness – Charity –Sympathy — Generosity – Brotherhood - Adaptability.

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4.Pathway to Blissful life:

Signs of anger – Root cause – Chain reaction – Evil effects on Body and Mind – Analyzing roots of worries – Techniques to eradicate worries.

5.Therapeutic measures: Spine strengthening exercises - Nero muscular breathing exercises - Laughing therapy - Mindfulness meditation.

Workshop mode

REFERENCES

1. INTERPERSONAL SKILLS Tutorial (PDF Version) - TutorialsPoint www.tutorialspoint.com/interpersonal_skills/interpersonal_skills_tutorial.pdf
2. INTERPERSONAL RELATIONSHIPS AT WORK - KI Open Archive - Karolinska www. publications.ki.se/xmlui/bitstream/handle/10616/39545/thesis.pdf?sequence=1
3. VALUES EDUCATION FOR PEACE, HUMAN RIGHTS, DEMOCRACY – UNESCO www.unesdoc.unesco.org/images/0011/001143/114357eo.pdf
4. MANEUVERING OF SIX TEMPERAMENTS - Vethathiri Maharishi www.ijhssi.org/papers/v5(5)/F0505034036.pdf
5. THE BLISS OF INNER FIRE: HEART PRACTICE OF THE SIX ... - Wisdom Publications - www.wisdompubs.org/sites/.../Bliss%20of%20Inner%20Fire%20Book%20Preview.pd...

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III Semester

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U18MAT3101 PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS

L	T	P	J	C
3	1	0	0	4

(Common to AE/AUE/CE/ME/MCE/EEE)

Course Outcomes (COs):

After successful completion of this course, the students should be able to:

CO 1 Formpartialdifferentialequationsandsolvecertaintypesofpartialdifferential equations.

CO 2 Determine the Fourier Series and half range Fourier Series of a function.

CO 3 Solveonedimensionalwaveequation,onedimensionalheat equationinsteadystateusingFourierseries.

CO 4 ApplyFourierseriestosolvethesteadystatetwo-dimensionalheatequationin cartesiancoordinates.

CO 5 IdentifyFouriertransform,Fouriersineandcosinetransformofcertain functionsanduseParseval'sidentitytoevaluateintegrals.

CO 6 EvaluateZ–transformofsequencesandinverseZ–transformoffunctionsand solve differenceequations.

Pre-requisite: NIL

CO/PO Mapping (S/M/Windicatesstrengthofcorrelation)S-Strong, M-Medium,W-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M			M				M	M		S		
CO2	S	M		M										
CO3	S	S	S		S				M	M		S		
CO4	S	M	M									M		
CO5	S	M	M		S									
CO6	S	S			S				M	M		S		

Course Assessment methods:

Direct
1. Continuous Assessment Test I,II 2. Openbooktest;Cooperativelearningreport,Assignment;Journalpaperreview,Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (asapplicable) 3. End SemesterExamination
Indirect
1. Course-end survey

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PARTIAL DIFFERENTIAL EQUATIONS **9+3 Hours**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of PDE by variable separable method – Solution of standard types of first order partial differential equations (excluding reducible to standard types) – Lagrange's linear equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients.

FOURIER SERIES **9+3 Hours**

Dirichlet's conditions – General Fourier series – Odd and Even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.

BOUNDARY VALUE PROBLEMS – ONE DIMENSIONAL EQUATIONS **5+2 Hours**

Classification of second order quasi linear partial differential equations –Solution of one-dimensional wave equation – One dimensional heat equation (excluding insulated ends), Fourier series solutions in Cartesian coordinates.

BOUNDARY VALUE PROBLEMS – TWO DIMENSIONAL EQUATIONS **4+1 Hours**

Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

FOURIER TRANSFORM **9+3 Hours**

Statement of Fourier integral theorem – Infinite Fourier transforms – Sine and Cosine Transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

Z –TRANSFORM **9+3 Hours**

Z-transform - Elementary properties – Convolution theorem- Inverse Z – transform
(by using partial fractions, residues and convolution theorem) – Solution of difference equations using Z - transform.

Theory: 45 **Tutorial: 15** **Practical: 30** **Project: 0** **Total: 60 hours**

References:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition. 2014.
2. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
3. Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume III", S.Chand& Company ltd., New Delhi, 2006.
4. Ian Sneddon., "Elements of partial differential equations", McGraw – Hill, New Delhi, 2003.
5. Arunachalam T., "Engineering Mathematics III", Sri Vignesh Publications, Coimbatore 2013.

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U18MEI3201	METAL CUTTING AND COMPUTERAIDED MANUFACTURING	L	T	P	J	C
		3	0	2	0	4

Course outcomes

After successful completion of the course, the student would be able to

CO 1 Apply the fundamentals of metal cutting and cutting tool materials

CO 2 Study the types of machine tools and working principles of machine tools

CO 3 Apply principles of surface integrity in finishing processes and study gear manufacturing techniques

CO 4 Apply the manufacturing activities inter relation with computers for plant operations

CO 5 Apply the concept of Group Technology in computer aided manufacturing

CO 6 Apply system modeling tools in CIM and the fundamental concepts of data communications

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	ProgrammeOutcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S							S	S				S
CO2	M								S	S				S
CO3	S								S	S				S
CO4	M						M							S
CO5	M						M		M	M				S
CO6	M				M		M		M	M				S

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; Group Presentation, Project 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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THEORY OF METAL CUTTING **9 Hours**

Introduction to Metal Cutting Methods – Mechanics of Metal Cutting – Orthogonal – Oblique – Merchants' Circle Diagram – Details of Derivation – Chip Details – Heat Generation – Cutting Tool Life – Cutting Tool Nomenclature – Economics of tool life – Optimal cutting speed for productivity - Cutting tool Materials - Cutting fluids – Recent Developments and Applications - Dry Machining and High-Speed Machining

MACHINE TOOLS **8 Hours**

Introduction to Lathe – Shaper – Planning – Milling – Drilling – Boring – Grinding – Honing – Working Principles – Operations – Working Holding Devices.

SURFACE FINISHING PROCESSES AND GEAR MANUFACTURING **8 Hours**

Grinding Machines – Grinding wheel Specifications – Honing – Lapping –Burnishing – Super Finishing – Surface Integrity concepts – Gear Manufacturing Processes – Gear cutting – Gear Hobbing – Gear Shaping Machines – Manufacture of Spur – Helical – Bevel – Worm and Worm Wheel – Gear Finishing, Honing.

INTRODUCTION TO NUMERICAL CONTROL **7 Hours**

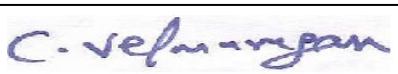
Introduction, programmed automation, Nomenclature, type and features of NC machine tools, Axes designation, point to point, straight and continuous control systems

INTRODUCTION TO COMPUTER INTEGRATED MANUFACTURING **7 Hours**

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems- product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING **7 Hours**

Role of Group Technology in CAD/CAM integration - part families - classification and coding – DCLASS, MICLASS and OPITZ coding systems-benefits of Group Technology Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning -variant approach and generative approaches.



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INTEGRATED LAB EXPERIMENTS:

1. Spur Gear cutting using Milling machine
2. Dove tail machining using shaper machine
3. Cylindrical grinding and Surface grinding on given workpiece
4. Facing, plain and step turning and taper turning.
5. Single start V-Thread cutting and knurling.
6. Boring and internal thread cutting.
7. Manual part programming (using G and M codes) in CNC Lathe. Machining operations include turning, facing, taper turning, and step turning (any two operations).
8. Machining operations include Linear and Circular interpolation, chamfering and grooving (any two operations).
9. Manual part programming (using G and M codes) in CNC Milling. Machining operations include Linear and Circular interpolation (contour motions).

Theory: 45 Tutorial: 0 Practical: 30 Project: 0 Total: 75 hours

REFERENCES:

1. Jain, R.K., and Gupta, S.C., "Production Technology", Khanna Publishers, New Delhi, 2004.
2. Sharma P.C., "A Text Book of Production Technology", S.Chand& Company Ltd., New Delhi,2010.
3. HajraChoudhry, S.K., and Bose, S.K., "Workshop Technology", Media Promoters and Publishers Pvt. Ltd., Bombay, 2004.
4. Mikell.P.Groover,"Automation, Production Systems and computer integrated manufacturing", Pearson Education,2007.
5. Radhakrishnan P, SubramanyanSandRaju V., "CAD/CAM/CIM",New Age International (P) Ltd, New Delhi, 2004.
6. Ranky, Paul G.,"Computer Integrated Manufacturing", Prentice Hall International, 2003.
7. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe "Computer Integrated Design and Manufacturing", McGraw-Hill Inc, 2004.

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U18MET3002	ENGINEERING MECHANICS	L	T	P	J	C
		3	0	0	0	3

CO 1 Apply the fundamental concepts in determining the effect of forces on a particle.

CO 2 Make use of various principles in the determination of effect of forces in a rigid body.

CO 3 Determine the geometry dependent properties of solids and sections

CO 4 Solve problems in static friction

CO 5 Identify motion and determine the velocity and acceleration of a particle

CO 6 Apply the principles of kinetics in solving problems in dynamics

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S						W						M	
CO2	S						W						M	
CO3	S						W						M	
CO4	M						W						M	
CO5	M						W						M	
CO6	M						W						M	

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; Group Presentation, Project 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

STATICS OF PARTICLES **9 hours**

Introduction - Laws of Mechanics, Parallelogram and triangular Laws of forces – Coplanar Forces - Resolution and Composition of forces – Free body diagram - Equilibrium of a particle– Lami's theorem – Equilibrium of a particle in space.

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STATICS OF RIGID BODIES **9 hours**

Principle of transmissibility – Moment of force about a point – Varignon's theorem – Moment of a couple – Equivalent couple – Moment of force about an axis – Coplanar non-concurrent forces acting on rigid bodies – Resultant and equilibrium – Resolution of a given force into force couple system – Equilibrium in three dimensions – Reactions and supports.

GEOMETRY DEPENDENT PROPERTIES **9 hours**

Centre of gravity, Centre of mass and Centroid – Moment of Inertia of simple and complex areas – Transfer formula – Radius of gyration – Polar moment of inertia – Product of inertia - Mass moment of Inertia of simple solids.

FRICTION **9 hours**

Laws of friction – coefficient of friction – Dry friction – wedge friction – ladder friction – rolling resistance.

KINEMATICS OF PARTICLES **3 hours**

Kinematics – Rectilinear and curvilinear motion – projectile motion

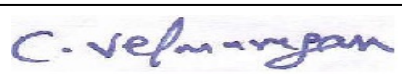
KINETICS OF PARTICLES **6 hours**

Kinetics – Newton's law – D'Alembert's Principle – Work Energy method – Principle of Impulse momentum - Impact

Theory: 45 Tutorial: 0 Practical: 0 Project: 0 Total: 45 hours

REFERENCES:

1. Beer F P and Johnson E R, "Vector Mechanics for Engineers, Statics and Dynamics", Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi, 2006.
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013. 2. J.L. Meriam & L.G. Karige, Engineering Mechanics: Statics (Volume I) and Engineering Mechanics: Dynamics (Volume II), 7th edition, Wiley student edition, 2013.
3. P. Boresi& J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
4. Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics-Statics and Dynamics", Vikas Publishing House Pvt. Ltd., New Delhi, 2006



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U18MET3003	ENGINEERING THERMODYNAMICS	L	T	P	J	C
		3	0	0	0	3

(Use of standard Steam table and Mollier diagram, Psychrometric Chart and Gas Tables are permitted)

Course outcomes

After successful completion of the course, the student would be able to

CO 1 Illustrate basic concepts for solving problems in open and closed system.

CO 2 Apply second law concepts to heat engine and heat pumps.

CO 3 Apply concepts of entropy

CO 4 Compare the performance of various vapor power cycles

CO 5 Illustrate the significance of thermodynamics relations

CO 6 Solve problems in various psychrometric processes

Pre-requisite: Nil

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak													
COs	**Programme Outcomes(POs)**												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	M								S	M		W	M	
CO2	S	W							S	S		M	M	
CO3	S	W							M	M			M	
CO4	S	M							S	S		W	S	
CO5	M									S			M	
CO6	M								M	M			M	

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; Group Presentation, Project 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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BASIC CONCEPTS AND FIRST LAW **12 hours**

Basic concepts - concept of continuum, macroscopic approach: thermodynamic systems - closed, open and isolated: Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics – SFEE - Application to closed and open systems

SECOND LAW AND ENTROPY **12 hours**

Second law of thermodynamics – Kelvin's and Clausius statements of second law, Heat Engines, Refrigerator and Heat Pump, Coefficient of Performance, Reversibility Carnot cycle - reversed Carnot cycle, efficiency, Carnot theorem, Thermodynamic temperature scale. Clausius theorem, Clausius inequality, concept of entropy, entropy of ideal gas, change of entropy for different non-flow processes, principle of increase of entropy – absolute entropy, Availability and irreversibility

STEAM AND VAPOUR CYCLES **10 hours**

Formation of steam at constant pressure, types of steam, steam tables and uses, external work done during evaporation, internal energy of Steam, dryness fraction of steam, entropy of steam – Mollier diagram steam power cycles, standard Rankine cycle, modified Rankine cycle. Reheat and regenerative cycle, Air standard otto cycle, Process making of the cycle, Cycle thermal efficiency, Compression expansion ratio and cycle efficiency, Deviation of real spark ignition engine from ideal cycle engines.

IDEAL AND REAL GASES AND THERMODYNAMIC RELATIONS **7 hours**

Properties ideal and real gases, equation state, VanderWall's equation of state, compressibility factor, compressibility chart- Dalton's law of partial pressure, exact differentials, T-D relations, Maxwell's relations, ClausiusClapeyron equations, Joule-Thomson coefficient.

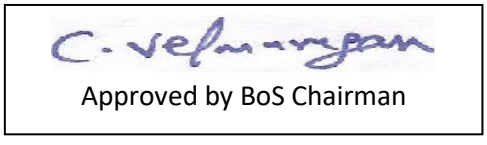
PSYCHROMETRY **4 hours**

Avagadro's Law, equation state, Gas mixtures, Dalton's law, Psychrometry and psychrometric charts, property calculations of air vapor mixtures.

Theory: 45 **Tutorial: 0** **Practical: 0** **Project: 0** **Total: 45 hours**

REFERENCES:

1. Nag, P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2008.
2. Cengel Y., "Thermodynamics An Engineering Approach", Tata McGraw-Hill, NewDelhi, 2008.
3. Holman.J.P. "Thermodynamics",Tata MC Graw Hill, 2006.
4. Arora, C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2004.



5. Merala, C. Pother, Craig, W., Somerton, “Thermodynamics for Engineers”, Schaum Outline Series, McGraw-Hill, 2008.
6. Rogers and Mayhew, “Engineering Thermodynamics”, Work and Heat Transfer, Pearson education, 1992.

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U18MET3004	COMPUTER AIDED DESIGN	L	T	P	J	C
		3	0	0	0	3

Course Outcomes (COs)

After successful completion of the course, the students should be able to

CO 1 Apply the concepts of computer graphics and graphics systems.

CO 2 Apply transformations and graphics pipeline procedure.

CO 3 Apply the concepts of various types of curves and surfaces.

CO 4 Practice the solid modeling features.

CO 5 Apply various Graphic file standards with their importance.

CO 6 Apply Interactive Computer Programming techniques.

Pre-requisite: Nil

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak														
COs	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1			M		S									
CO2		M												
CO3	M		M										M	
CO4					S								M	
CO5					M									
CO6					M									

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

FUNDAMENTALS OF COMPUTER GRAPHICS **9 hours**

Product cycle- Design process- sequential and concurrent engineering- Computer aided design —CAD system architecture- Computer graphics — co-ordinate systems- 2D and 3D transformations-homogeneous coordinates - Line drawing -Clipping- viewing transformation

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GEOMETRIC MODELING **9 hours**

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves- Techniques for surface modeling — surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep

VISUAL REALISM **9 hours**

Hidden — Line-Surface-Solid removal algorithms — shading — colouring — computer animation.

ASSEMBLY OF PARTS **9 hours**

Assembly modelling — interferences of positions and orientation — tolerance analysis- massproperty calculations — mechanism simulation and interference checking.

CAD STANDARDS **9 hours**

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchangeimages-Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALSetc. -communication standards.

Theory: 45 Tutorial: 0 Practical: 0 Project: 0 Total: 45 Hours

REFERENCES:

1. Donald Hearn and Pauline Baker, “Computer Graphics C Version”, Pearson Education, 2004.

2. Michael E Mortenson, “Geometric Modeling”, John Wiley and Sons, Inc., 2004.

3. David F Rogers and Alan Adams J, “Mathematical Elements in Computer Graphics”, Tata McGraw Hill, 2002.

4. James D Foley, Andries Van Dam, Steven K Feiner and John F Hughes, “Computer Graphics Principles and Practice”, AddisonWesley Publishing Company, 2000.

5. MarttiMantyla, “An Introduction to Solid Modeling”, Springer Verlag, 1987.

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U18MEI3205	MACHINE DRAWING	L	T	P	J	C
		2	0	2	0	3

Course Outcomes (COs)

After successful completion of the course, the students should be able to

CO 1 Identify appropriate drawing standards.

CO 2 Draw2-D drawings of mechanical components.

CO 3 Identify appropriate drawing packages.

CO 4 Draw3-D drawings and assembling of mechanical components.

CO 5 Concepts of interchangeability in assembly drawings.

CO 6 Read and interpret blueprints.

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

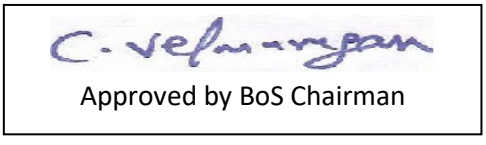
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M				S								
CO2	S	S		S	M	S								
CO3					S								M	
CO4	S	S		S	M	S							M	
CO5	M	S				M								
CO6	M	M		S		M								

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

DRAWING STANDARDS & FITS AND TOLERANCES **12 hours**

Code of practice for Engineering Drawing, BIS specifications Welding symbols, riveted joints, keys, fasteners Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits Tolerancing of individual dimensions Specification of Fits Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & tolerancing.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INTRODUCTION TO 2D DRAFTING **16 hours**

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing.

Bearings - Bush bearing, Plummer blockValves Safety and non-return valves.

ASSEMBLY DRAWING **32 hours**

Couplings Flange, Universal, Oldham s, Muff, Gear couplings

Joints Knuckle, Gib & cotter, strap, sleeve & cotter joints

Engine parts Piston, connecting rod, cross-head (vertical and horizontal), stuffing box,

Miscellaneous machine components: Screw jack, machine vice, and tail stock.

TOTAL:60 hours

REFERENCES:

1. Gopalakrishna K.R., MachineDrawing, 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013
2. Bertoline, Wiebe, Miller, Nasma., ―Technical Graphics Communication, IR WIN Graphic Series, 2008.
3. S. Bogolyubov. A. Voinov., ―Engineering Drawing, Van Nostrand Reinhold Company, 2001.
4. D. E. Hewitt., ―Engineering Drawing and Design for Mechanical Technicians, The Macmillan Press Ltd, London, 2006.
5. William P. Spence, Engineering Graphics, Printice - Hall Inc, Engle Wood Cliff
6. Brain Griffiths., Engineering Drawing for Manufacture, Kogan Page Science, USA, 2003

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U18INI3600 **ENGINEERING CLINIC - III**

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:

CO1: Identify a practical problem and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

1. U18INI2600 ENGINEERING CLINIC - II

CO/PO Mapping (S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak													
COs	Programme Outcomes(POs)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	**Indirect**
1. Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the Third semester, students will focus primarily on Design project combining concepts learnt in Engineering clinics I and II.

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GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific task, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U18VEP3503	FAMILY VALUES (Mandatory)	L	T	P	J	C
		0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop skills in maintaining the harmony in the family.
CO 2: Create impulsive activities for healthy family
CO 3: Be receptive to troubled Individuals
CO 4: Gain healthy life by practicing Kundalini Yoga &Kayakalpa
CO 5: Possess Empathy among family members.
CO 6: Reason the life and its significance

Pre-requisites:

1. U18VEP1501 / PERSONAL VALUES
2. U18VEP2502 / INTERPERSONAL VALUES

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									S					
CO2							M							
CO3										M				
CO4												S		
CO5						S								
CO6								M						

Course Assessment methods

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

Values through Practical activities:

1. Family system: Introduction to Family Values – elements of family values - Adjustment, Tolerance, Sacrifice - Family structure in different society – work life balance.

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2. Peace in Family: Family members and their responsibility - Roles of parents, children, grant parents -. Respectable women hood

3. Core value: Empathy: Unconditional love - Respect - Compassion - sacrifice–Care &share - helping – emotional support- hospitality – cleanliness

4. Blessing: Blessing - methods - Vibration effect - Benefits - Reason for misunderstanding in the Family and resolution through blessings.

5. Healthy Family: Good relationship with neighbors - Counseling - Simplified Kundalini Yoga - Kaya Kalpa Yoga

Workshop mode

REFERENCES

1. FAMILY - www.download.nos.org/331courseE/L-13%20FAMILY.pdf

2. FRAMEWORK FOR ACTION ON VALUES EDUCATION IN EARLY CHILDHOOD – UNESCO – PDF – www.unesdoc.unesco.org/images/0012/001287/128712e.pdf

3. TRUE FAMILY VALUES Third Edition - Tparents Home www.tparents.org/Library/Unification/Books/TFV3/_TFV3.pdf

4. FAMILY VALUES IN A HISTORICAL PERSPECTIVE - The Tanner Lectures on www.tannerlectures.utah.edu/_documents/a-to-z/s/Stone95.pdf

5. PROBLEMS OF INDIA'S CHANGING FAMILY AND STATE ... - the United Nations - www.un.org/esa/socdev/family/docs/egm09/Singh.pdf

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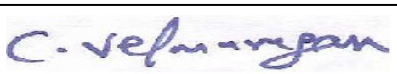
IV Semester



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L	T	P	J	C
3	1	0	0	4

U18MAT4101 NUMERICAL METHODS AND PROBABILITY

(Common to AE/AUE/CE/ME/MCE/EEE)

COURSE OUTCOMES

After successful completion of this course, the students will be able to

- **CO1:** Apply various numerical techniques for solving non-linear equations and systems of linear equations.
- **CO2:** Analyze and apply the knowledge of interpolation and determine the integration and differentiation of the functions by using the numerical data.
- **CO3:** Predict the dynamic behavior of the system through solution of ordinary differential equations by using numerical methods.
- **CO4:** Solve PDE models representing spatial and temporal variations in physical systems through numerical methods
- **CO5:** Apply the concepts of probability to random variables
- **CO6:** Construct probabilistic models for observed phenomena through distributions which play an important role in many engineering applications.

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	S	S												
CO2	S	S												
CO3	S	S							M					
CO4	S	S												
CO5	S	S							M					
CO6	S	S												

COURSE ASSESSMENT METHODS

Direct
1. Continuous Assessment Test I, II 2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable) 3. End Semester Examination
Indirect
1. Course-end survey

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SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9+3 Hours

Linear interpolation method – Iteration method – Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordan methods - Iterative methods: Gauss Jacobi and Gauss - Seidel methods – Inverse of matrix by Gauss – Jordan method – Eigenvalues of a matrix by Power method.

INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3 Hours

Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's rules.

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3 Hours

Single step methods: Taylor's series method – Euler and Improved Euler methods for solving a first order equations – Fourth order Runge-Kutta method for solving first and second order equations – Multistep method: Milne's predictor and corrector method.

BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS 9+3 Hours

Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain–Solution of one-dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes –Solution of one dimensional wave equation by explicit scheme.

PROBABILITY AND RANDOM VARIABLES 9+3 Hours

Axioms of probability - Conditional probability – Total probability – Bayes' theorem – Random variable – Distribution function – properties – Probability mass function- Probability density function – moments - Binomial, Poisson and Normal distributions – Properties.

Theory: 45 Hours Tutorials: 15 Hours Total: 60 Hours

REFERENCES

1. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 7th Edition, Pearson Education Asia, New Delhi, 2007.
3. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 7th Edition, Tata McGraw-Hill, New Delhi, 2016.
4. R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
5. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th edition, 2017.
6. Gupta S.C, and Kapur V.K "Fundamentals of Applied Statistics", Sultan Chand, New Delhi, 4th Edition, 2014.

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U18MEI4201	STRENGTH OF MATERIALS	L	T	P	J	C
		3	0	2	0	4

Course Outcomes

After successful completion of the course, the student would be able to

CO 1 Apply fundamental concepts and compute simple stresses and deformations in structural members.

CO 2 Construct shear force and bending moment diagrams for statically determinate beams and determine stress distribution.

CO 3 Compute slope and deflection in statically determinate beams.

CO 4 Examine the buckling failure in columns and calculate strain energy under varying load conditions.

CO 5 Solve problems on shafts and springs subjected to twisting moment.

CO 6 Apply the concepts of complex stress system in 2D systems and in thin walled containers.

Pre-requisite: U18MET3002- Engineering Mechanics

CO/PO Mapping
(S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M		M									M	
CO2	S	M											M	
CO3	M	W		M									M	
CO4	M	W		M									M	
CO5	S	M		M									M	
CO6	M	W											M	

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; Group Presentation, Project 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
1. Course-end survey

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SIMPLE STRESSES AND STRAINS **9 hours**

Stress and strain - Stress-strain diagrams - Factor of safety – Stresses and strains in stepped bars and uniformly varying sections – Stresses in composite bars due to axial loads and temperature - Relationships among elastic constants.

SHEAR AND BENDING IN BEAMS **9 hours**

Shear force and bending moment diagrams for statically determinate beams. Theory of simple bending - Stress distribution along length and in beam section – Shear stresses in beams.

DEFLECTION OF BEAMS **7 hours**

Slope and deflection in determinate beams - Double integration method, Macaulay's method, Moment area method.

BUCKLING OF COLUMNS AND STRAIN ENERGY **6 hours**

Columns – End conditions – Euler's formula – Rankine's formula.Strain energy under gradual, sudden and impact loading

TORSION **7 hours**

Torsion of circular and hollow shafts - Elastic theory of torsion - Stresses and deflection in solid and hollow shafts - stepped shaft - Shafts in series and parallel. Springs - closed and open coiled helical springs.

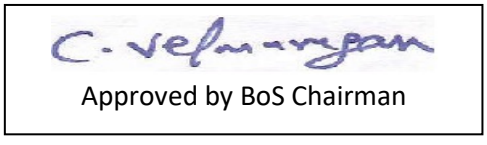
COMPLEX STRESSES **7 hours**

State of stress at a point - Normal and Shear stresses on any plane - Principal stresses and strains in two dimension – Analytical method, Mohr's circle method. Hoop and longitudinal stresses in thin cylinders and shells.

INTEGRATED LAB EXPERIMENTS

1. Tension test on a mild steel rod
2. Shear test on a mild steel rod
3. Torsion test on mild steel rod
4. Hardness test on metals - Brinell and Rockwell Hardness
5. Deflection test on beams
6. Compression test on helical springs
7. Tensile test on helical springs
8. Impact Test

Theory: 45 **Tutorial: 0** **Practical: 30** **Project: 0** **Total: 75 Hours**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REFERENCES:

1. Popov E. P, “Engineering Mechanics of Solids”, Prentice-Hall of India, New Delhi, 2007.
2. Rajput R. K, “A Textbook of Strength of Materials”, S. Chand, 2007.
3. Subramanian R., “Strength of materials”, Oxford University Press, New Delhi, 2005
4. Bansal R. K, “Strength of materials”, Laxmi Publications, New Delhi, 2007.
5. William A.Nash, “Theory and Problems of Strength of materials, Schaum’s Outline series”, Tata McGraw-Hill, New Delhi, 2007.

Approved by BoS Chairman

U18MEI4202	FLUID MECHANICS AND MACHINERY	L	T	P	J	C
		3	0	2	0	4

Course outcomes

After successful completion of the course, the student would be able to

CO 1 State and explain various fluid properties.

CO 2 Apply the knowledge of fluid statics for solving the problems in buoyancy and manometers.

CO 3 Solve problems in mass, momentum and energy balance equations in fluid dynamics.

CO 4 Determine the flow rate through Venturi-meter and orifice meter.

CO 5 Analyze the performance of turbines and pumps.

CO 6 Illustrate the various tools for solving fluid dynamic problems.

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

CO's	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M										M	S	
CO2	S	M							M	M			M	
CO3	S	S		M					S	S			M	
CO4	S	M		M					M	M		M	M	
CO5	S	S		M					M	M		M	M	
CO6	W					M							W	

Course Assessment methods:

DIRECT
1. Continuous Assessment Test I, II (Theory component) 2. Assignment; Group Presentation, Project 3. Demonstration etc (as applicable) (Theory component) 4. Pre/Post - Experiment Test/Viva; Experimental Report for each Experiment (lab Component) 5. Model Examination (lab component) 6.End Semester Examination (Theory and lab components)
INDIRECT
2. Course-end survey

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FLUID PROPERTIES, STATICS AND KINEMATICS **10 Hours**

Fluid Properties: Importance & applications of fluid mechanics. Solid vs Fluid - Units and Dimensions – Properties of fluids (Definition only)-Mass density – Specific weight – Specific volume – Specific gravity – Viscosity – Compressibility – Surface tension – Capillarity – Vapor pressure.

Fluid Statics: Hydrostatic equation –Forces on plane and curved surfaces- Buoyancy – Metacentre – Simple and differential manometers. Fluid Kinematics: Path line – Stream line – Streak line – Stream and Potential functions – Flownets.

FLUID DYNAMICS **10 Hours**

Fluid Element and properties - Lagrangian vs Eulerian description – Governing equations: Mass balance (Continuity equation) – Newton's second law (momentum equation- statement only) – First law of thermodynamics (Energy equation-statement only). Non-viscous flows (Euler's equation) – Frictionless flows (Bernoulli's equation), Introduction to CFD.

Case study (not for exam): Demonstration of solving Euler's and Navier-Stokes equation using analysis tools like ANSYS, HyperWorks etc.

FLUID FLOW AND DIMENSIONAL ANALYSIS **10 Hours**

Laminar and turbulent flows through pipe – Hagen-Poiseuille equation – Darcy-Weishbach equation – Major and Minor losses.

Dimensional Analysis- Buckingham's π theorem- Discharge and velocity measurements- venture meter and pitot tube.

HYDRAULIC TURBINES **8 Hours**

Force exerted on moving plate/ vanes- Definition and classifications- Pelton, Francis, Propeller and Kaplan turbine: Working principles- Velocity triangle – Work done – specific speed – efficiencies – Performance curve for turbines.

HYDRAULIC PUMPS **7 Hours**

Definition and classifications- Centrifugal and Reciprocating Pumps: Working principles- Indicator diagram – Specific speed – efficiency and performance curves - Cavitation in pumps.

INTEGRATED LAB EXPERIMENTS

1. Determination of the Coefficient of discharge of a given Orifice meter.
2. Determination of the Coefficient of discharge of a given Venturi meter.
3. Characteristic curves of centrifugal / reciprocating pump.
4. Performance characteristics of Pelton wheel.

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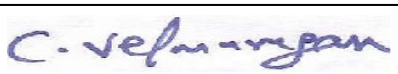
5. Performance characteristics of Francis turbine.

Theory: 45 Tutorial: 0 Practical: 30 Project: 0 Total: 75 Hours

REFERENCES:

1. P.N. Modi & S.M. Seth, "Hydraulics and fluid mechanics including hydraulic machines", Standard book house, 2005.
2. R.K. Bansal,"Fluid mechanics and hydraulic machines", Laxmi Publications (P) Ltd, 2006.
3. K.L. Kumar,"Engineering fluid mechanics", Eurasia publishing house, 2001.
4. V.L. Streeter – "Fluid mechanics", McGraw-Hill, 2002.
5. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, New Delhi, 2003.
6. Versteeg, H.K, and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Pearsons, 2007.



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U18MET4003	KINEMATICS OF MACHINERY	L	T	P	J	C
		3	0	2	0	4

After successful completion of the course, the student would be able to

CO 1: Apply the fundamental concepts in developing various mechanisms
CO 2: Analyze velocity and acceleration in planar mechanisms
CO 3: Synthesize simple mechanisms such as 4-bar and slider crank mechanisms
CO 4: Construct the cam profile for specific follower motion.
CO 5: Determine appropriate gears for requirements.
CO 6: Compute theparameters in gear trains and determine the speeds in gear boxes.

Pre-requisite: U18MET3002 Engineering Mechanics

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	W												W	
CO2	S	M		W					W				M	
CO3	M												M	
CO4	M	M		W									M	
CO5	M								W				M	
CO6	S			W					W				M	

Course Assessment methods:

Direct	Indirect
1. Internal Test I 2. Internal Test II 3. Assignment 4. End semester exam	Course end survey

BASICS OF MECHANISMS **6 Hours**

Terminology and Definitions- Degree of freedom, mobility-Kutzbach criterion- Grashoff's law- Gruebler's criterion - Mechanical Advantage -Transmission angle – Coupler curves - Kinematic Inversions of 4- bar chain and slider crank chains - Description of common mechanisms -- Ratchets and pawl mechanisms- Indexing mechanisms - Rocking mechanisms - Straight line generators – Steering mechanisms

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KINEMATICS OF PLANE MECHANISMS **11 Hours**

General plane motion - Relative velocity method – Displacement, velocity and acceleration analysis in simple mechanisms - Instantaneous center method, Kennedy theorem – Coincident points – Coriolis component of acceleration - Analytical method of kinematic analysis.

SYNTHESIS OF MECHANISMS **7 Hours**

Mechanism synthesis – Motion generation, path generation and function generation – Chebychev's spacing of accuracy points – Graphical and algebraic methods of synthesis of simple mechanisms such as 4 bar and slider crank mechanisms.

KINEMATICS OF CAM **8 Hours**

Classifications - Displacement diagrams - Uniform velocity, simple harmonic, uniform acceleration and retardation and cycloidal motions – Graphical layout of plate cam profiles – Derivatives of follower motion – High speed cams – Cams with specified contours - unbalance and wind up - Pressure angle and undercutting – spring surge, jump speed - Analysis of cam.

GEARS **6 Hours**

Introduction – Types – Terminology – Law of toothed gearing – Velocity of sliding – Involute and cycloidal tooth profiles – Interchangeable gears – Length of path and arc of contact – contact ratio – Interference and under cutting – Minimum number of teeth to avoid interference in pinion and gear – Nonstandard gear teeth.

GEAR TRAINS AND GEAR BOXES **7 Hours**

Gear trains –Simple, compound, reverted and epicyclic gear trains – Differentials.

Multi speed gear boxes – Speed ratio - Kinematic arrangement – Ray diagram.

Total:45 hours

REFERENCES:

1. Rattan, S.S.,"Theory of Machines", Tata McGraw-Hill Publishing Company Ltd.,New Delhi, 2009.
2. Uicker, J.J., Pennock, G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press,New Delhi, 2009.
3. Thomas Bevan, "Theory of Machines",CBS Publishers and Distributors, 2005.
4. Ghosh, A., and Mallick, A.K., "Theory of Mechanisms and Machines", Affiliated EastWestPvt. Ltd., New Delhi, 2006.
5. Rao, J.S., and Dukkipati, R.V, "Mechanism and Machine Theory", New Age International (P) Ltd Publishers. New Delhi, 2007.
6. Khurmi, R.S., and Gupta, J.K., "Theory of Machines", S.Chand& Company, 2009.
7. Norton L Robert, "Kinematics and Dynamics of Machinery",Tata McGraw Hill, Higher Education, 2008.

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U18CHT4003	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	J	C
		3	0	0	0	0

(Common to Automobile/Aeronautical/Mechanical/Mechatronics Engineering)

Course Outcomes

After successful completion of the course, the student would be able to

CO 1: Analyze the impact of engineering solutions in a global and societal context

CO 2: Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems

CO 3: Highlight the importance of ecosystem and biodiversity

CO 4: Ability to consider issues of environment and sustainable development in his personal and professional undertakings

CO 5: Paraphrase the importance of conservation of resources.

CO 6: Play an important role in transferring a healthy environment for future generations

Pre-requisite: Nil

CO/PO Mapping
(S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		M					S		M					M
CO2						M				M				
CO3							M							
CO4						M	S							
CO5							S							
CO6			W				S					M		

Course Assessment methods:

Direct	Indirect
1. Internal Test I 2. Internal Test II 3. Assignment 4. Group presentation 5. End semester exam	Course end survey

Course Content

OBJECTIVES

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

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INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **14 Hours**

Definition, scope and importance – Need for public awareness – Forest resources: Use and overexploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people

Water resources: Use and overutilization of surface and ground water, conflicts over water, dams benefits and problems - Water conservation, rain water harvesting, watershed management 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, case studies

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Wasteland reclamation – Role of an individual in conservation of natural resources

ECOSYSTEMS AND BIODIVERSITY **9 Hours**

ECOSYSTEM: Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Food chain, Food web, Energy flow in the ecosystem and Ecological pyramids - Ecological succession – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem

(d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY : Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values – India as a mega-diversity nation – Hot-spots 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.

ENVIRONMENTAL POLLUTION **10 Hours**

Definition – Causes, effects and control measures of: (a) Air pollution - Organic and inorganic pollution - cyclone separator, electrostatic precipitator(b) Water pollution (c) Heavy metal pollution (d) Noise pollution (e) Thermal pollution (f) Nuclear hazards - Role of an individual in prevention of pollution – Pollution case studies – Solid waste and hazardous Management: Causes, effects and control measures from factories, small scale and large scale industries - waste minimization – Disaster management: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT **7 Hours**

From Unsustainable to Sustainable development – Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns, case studies – Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Human Rights

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HUMAN POPULATION AND THE ENVIRONMENT **5 Hours**

Population growth and explosion – Welfare Programme- Environment and human health – Communicable disease – Role of Information Technology in Environment and human health – Case studies.

Theory: 45	**Tutorial: 0**	**Practical: 0**	**Project: 0**	**Total: 45 Hours**

REFERENCES:

1. Miller T.G, "Environmental Science", Wadsworth Publishing Co, 2013.
2. Masters G.M., and Ela W.P., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd.
3. BharuchaErach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad India, 2002.
4. Trivedi R.K and Goel P.K., "Introduction to Air pollution". Techno-science Publications. 2003.
5. Trivedi R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Enviro Media, 1996.
6. Cunningham, W.P., Cooper, T.H.., &Gorhani E., "Environmental Encyclopedia", Jaico Publication House, Mumbai, 2001
7. Wager K.D., "Environmental Management", W.B. Saunders Co., USA, 1998
8. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell science Publishing Co., 2003
9. Syed Shabudeen, P.S. "Environmental chemistry", Inder Publishers, Coimbatore, 2013

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U18EEI4207 ELECTRICAL DRIVES AND CONTROL

L	T	P	J	C
3	0	2	0	4

COURSE OUTCOMES:

After successful completion of this course, the students would be able to

CO1 Describe the construction, principle of operation and characteristics of DC motors

CO2 Distinguish the construction and operation various types of induction motors

CO3 Familiarize the speed control techniques for DC motor and induction motor

CO4 Describe the construction and operation of special electrical machines

CO5 Choose the suitable motor for specific application

PRE-REQUISITE

1.Engineering Physics

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	ProgrammeOutcomes(POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	W											W	
CO2	M	W											W	
CO3		W	S		W							W		W
CO4	W		M		M							W		W
CO5		M	W	M									W	

COURSE ASSESSMENT METHODS

Direct
1. Continuous Assessment Test I, II 2. Model Examination(For Practical courses & Embedded courses) 3. Assignment, Open book test; Cooperative learning report, Group Presentation, Problem based learning, Project based learning, Mini Projects, Project report, Quiz, Role play, Self-Explanatory videos, Prototype or Product Demonstration etc. (as applicable) 4. End Semester Examination
Indirect
1. Course-end survey
2. Programme Exit survey
3.Placement/Higher education record
4.Feedback (Students, Employers, Parents, Professional body members, Alumni)

THEORETICAL COMPONENT CONTENTS:

DC MACHINES **9 Hours**

Introduction to Magnetic Circuits - Construction of DC machines- Principle, operation and Torque equation of DC motor- Types of DC motors- DC Shunt Motor and series motors- Characteristics and Applications

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TRANSFORMERS AND AC MACHINES **9 Hours**

Principle of transformers- Three phase induction motors- Principle of operation - Construction- Types- Single phase Induction motors- - Starting methods- Types -Applications.

SPEED CONTROL OF DC MOTORS **9 Hours**

Basic components of Electrical Drives -Factors influencing the choice of electrical drives-Speed control of DC Shunt Motors- Armature control - Field control - Single phase fully controlled converter fed DC motor- Four quadrant chopper fed DC motor- Applications

SPEED CONTROL OF INDUCTION MOTOR **9 Hours**

Speed control of three phase induction motor- Stator voltage control using SCR based voltage controller- Rotor resistance control-Constant V/F ratio control using VSI- Applications

SPECIAL ELECTRICAL MACHINES **9 Hours**

Construction and operation: PMDC motor, Variable reluctance stepper motor, BLDC motor, AC Servo motor and Permanent magnet synchronous motor- Applications

TEXTBOOKS:

1. V. K. Mehta and Rohit Mehta, "Principles of Electrical Machines", S. Chand & Co Ltd, 2006.
2. Gopal K. Dubey, "Fundamentals of Electric Drives", 2nd Edition, Narosa Publishing House, New Delhi, 2015.

REFERENCES

1. Thereja .B.L, —Fundamentals of Electrical Engineering and Electronics, S. Chand & Co Ltd, 2008.
2. J.B.Gupta, —Theory and Performance of Electrical Machines, 14th Edition, S.K.Kataria and Sons, 2010, New Delhi.
3. S.K. Pillai, "A First Course on Electrical Drives", 3rd Edition, New Age International Publishers, New Delhi, 2014.

List of Experiments:

1. Load test on DC shunt motor
2. Load test on DC series motor
3. Speed control of DC shunt motor
4. Load test on single phase induction motor
5. Speed control of fully controlled converter fed DC motor
6. Speed control of three phase induction motor using V/f control
7. Speed control of BLDC motor
8. Speed control of Stepper motor
9. Study of Transformer
10. Study of four quadrant DC drive

Theory: 45 Tutorial: 0 Practical: 30 Project: 0 Total: 75 Hours

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U18INI4600 ENGINEERING CLINIC - IV

L	T	P	J	C
0	0	4	2	3

Course objectives

- To help the students look into the functioning of simple to complex devices and systems
- To enable the students to design and build simple systems on their own
- To help experiment with innovative ideas in design and team work
- To create an engaging and challenging environment in the engineering lab

Course Outcomes

After successful completion of this course, the students should be able to:

CO1: Identify a practical problems and find a solution
CO2: Understand the project management techniques
CO3: Demonstrate their technical report writing and presentation skills

Pre-requisite:

1. U18INI3600 Engineering Clinic III

CO/PO Mapping
(S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	S	S	S	S	M	W		S			S		
CO2											S			
CO3										S				

Course Assessment methods:

Direct	Indirect
1. Project reviews 50%	1. Course Exit Survey
2. Workbook report 10%	
3. Demonstration & Viva-voce 40%	

Content:

The course will offer the students with an opportunity to gain a basic understanding of computer controlled electronic devices and apply the concepts to design and build simple to complex devices. As a practical project based embedded course, the students will be taught the concepts using a variety of reference material available in the public domain. While the course will start with formal instruction on hardware, programming and applications, the major portion of the course will provide the students with ample opportunity to be innovative in designing and building a range of products from toys to robots and flying machines.

In the fourth semester, students will focus primarily on Reverse engineering project to improve performance of a product

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GUIDELINES:

1. Practical based learning carrying credits.
2. Multi-disciplinary/ Multi-focus group of 5-6 students.
3. Groups can select to work on a specific tasks, or projects related to real world problems.
4. Each group has a faculty coordinator/Instructor who will guide/evaluate the overall group as well as individual students.
5. The students have to display their model in the 'Engineering Clinics Expo' at the end of semester.
6. The progress of the course is evaluated based on reviews and final demonstration of prototype.

Total Hours: 90

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U18VEP4504	PROFESSIONAL VALUES (Mandatory)	L	T	P	J	C
		0	0	2	0	0

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Develop the ethical values in both professional and personal life
CO 2: Develop ability to take decision to reinforce professional life
CO 3: Rational in professional skills required for diverse society
CO 4: Excel in ingenious attitude to congregate professional life
CO 5: Research into the professional stand
CO 6: Spruce an Individual with decorum to achieve professional life

Pre-requisites:

1. U18VEP1501 / PERSONAL VALUES
2. U18VEP2502 / INTERPERSONAL VALUES
3. U18VEP3503 / FAMILY VALUES

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1								S						
CO 2				M										
CO 3			S											
CO 4												S		
CO 5								M						
CO 6										M				

Course Assessment methods

Direct
1.Group Activity / Individual performance and assignment 2.Assessment on Value work sheet / Test
Indirect
1. Mini project on values / Goodwill Recognition

Values through Practical activities:

1.Professional skills With Values: Positive Attitude, Adaptability, Responsibility, Honesty and Integrity, Self Esteem, & Self Confidence

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2.Building Innovative work cultures: Creative thinking, Critical thinking, Conflict Resolution, Problem Solving, & Decision making

3.Professional Work Ethics: Types of Ethics, Etiquette, personality Grooming, Emotional quotient, Human Dignity, Safety & Role of Professional in Social Responsibility

4.Engineering Ethics: Engineering Council of India - Objectives - Code of Ethics - Social responsibility -Professional Quality - Ethical issues - Effects - Strategy – Corruption, Consequences, Cures

5.Case studies in engineering ethics: Discussion of case studies relating to Public safety, health, welfare, Quality of product, Improper conduct by management, Product responsibility, Intellectual property

Workshop mode

REFERENCES

1. LEARNING TO DO SOURCEBOOK 3 - UNESCO-UNEVOC -PDF
www.unevoc.unesco.org/fileadmin/user_upload/pubs/LearningToDo.pdf

2. DECLARATION OF PROFESSIONAL VALUES AND ETHICAL STANDARDS
www.garda.ie/Documents/User/declarationvalues.pdf

3. KARMA YOGA - SWAMI VIVEKANANDA
www.vivekananda.net/PDFBooks/KarmaYoga.pdf

4. PROFESSIONAL ETHICS IN ENGINEERING - Sasurie College of Engineering
www.sasurieengg.com/.../GE2025%20Professional%20Ethics%20in%20Engineering.

5. ENGINEERING ETHICS CASE STUDY; Challenger
www.ucc.ie/en/processeng/staff/academic/ebyrne/.../PE1006PptNotesLect7.pdf

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