KUMARAGURUCOLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

COIMBATORE – 641049

REGULATIONS 2018

SYLLABUS

1st to 4th Semesters

BE MECHATRONICS ENGINEERING

DEPARTMENT OF MECHATRONICS ENGINEERING

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VISION

To achieve academic and industrial excellence in industrial automation research and innovative product development driven by mechatronics systems.

MISSION

- Impart the right blend of knowledge and skills to students and enable them to apply it in real life situations.
- Motivate the students towards interdisciplinary research to cater to the local and global needs.
- Achieve innovation in developing industrial products with social responsibility.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

I. To develop innovative and sustainable products with multidisciplinary Engineering expertise.

II. To solve complex engineering problems by applying mechanical, electrical and computer knowledge and engage in lifelong learning in their profession

III. To work or pursue higher education in multicultural, multilingual and multinational environment with competent oral and written communication.

IV. To lead and contribute in a team entrusted with professional, social and ethical responsibilities.

PROGRAM OUTCOMES (POs)

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

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

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

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

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

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

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

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

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

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

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

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

PO12: 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 Aeronautical Engineering Undergraduate Program will have the ability to:

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

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

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KUMARAGURU COLLEGE OF TECHNOLOGY

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REGULATIONS 2018

B.E. MECHATRONICS ENGINEERING

CURRICULUM

Semester I										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAI1201	Linear Algebra and Calculus	Theory	BS	3	0	2	0	4	-
2	U18CHI1201	Engineering Chemistry	Embedded - Theory & Lab	BS	3	0	2	0	4	-
3	U18ENI1201	Fundamentals of Communication-I	Embedded - Theory & Lab	HS	2	0	2	0	3	-
4	U18MEI1101	Engineering Graphics	Embedded - Theory & Lab	ES	2	0	2	0	3	-
5	U18CSI1202	Problem solving and Programming using C	Embedded - Theory & Lab	ES	2	0	2	0	3	-
6	U18INI1600	Engineering Clinic I	Practical and Project	ES	0	0	4	2	3	-
								Total Credits	20	
								Total Contact Hours/week	28	

Semester II										Pre-requisite
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MAI2201	Advanced Calculus and Laplace Transforms	Embedded - Theory & Lab	BS	3	0	2	0	4	U18MAI1201
2	U18PHI2201	Engineering Physics	Embedded - Theory & Lab	BS	3	0	2	0	4	-
3	U18ENI2201	Fundamentals of Communication-II	Embedded - Theory & Lab	HS	2	0	2	0	3	-
4	U18MET2003	Engineering Mechanics	Theory	ES	3	0	0	0	3	-
5	U18CSI2201	Python Programming	Embedded - Theory & Lab	ES	2	0	2	0	3	-

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6	U18INI2600	Engineering Clinic II	Practical and Project	ES	0	0	4	2	3	-
									Total Credits	20
									Total Contact Hours/week	27

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	U18MCI3201	Electronic Devices and Circuits	Embedded - Theory & Lab	ES	3	0	2	0	4	-
3	U18MCI3202	Electrical Machines	Embedded - Theory & Lab	PC	3	0	2	0	4	-
4	U18MCT3103	Mechanics of solids	Theory	ES	3	1	0	0	4	-
5	U18MCT3104	Fluid Mechanics and Thermal Sciences	Theory	ES	3	1	0	0	4	-
6	U18INI3600	Engineering Clinic III	Practical and Project	ES	0	0	4	2	3	-
									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	U18MCI4201	Hydraulics and Pneumatics	Embedded - Theory & Lab	PC	3	0	2	0	4	-
3	U18MCI4202	Sensors and Instrumentation	Embedded - Theory & Lab	PC	3	0	2	0	4	-
4	U18MCT4103	Digital Electronics and Microprocessor	Theory	PC	3	1	0	0	4	U18MCI3201
5	U18MCT4104	Theory of Machines	Theory	PC	3	1	0	0	4	-
6	U18INI4600	Engineering Clinic IV	Practical and Project	ES	0	0	4	2	3	-
									Total Credits	23
									Total Contact Hours/week	28

Semester V										**Pre-requisite**
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	

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1	U18MCI5201	Industrial Electronics and drives	Embedded - Theory & Lab	PC	3	0	2	0	4	U18MCI3202
2	U18MCI5202	Manufacturing Technology	Embedded - Theory & Lab	PC	2	0	2	0	3	-
3	U18MCI5203	Programmable logic controller	Embedded - Theory & Lab	PC	3	0	2	0	4	-
4	U18MCT5004	Control Engineering	Theory	PC	3	0	0	0	3	-
5	U18MCT5105	Design of Machine Elements	Theory	PC	3	1	0	0	4	U18MCT3103
6	U18MCE00**	Open Elective I	Theory	OE	3	0	0	0	3	-
7	U18INI5600	Engineering Clinic V	Practical and Project	ES	0	0	4	2	3	-
								Total Credits		24
								Total Contact Hours/week		30

Semester VI										**Pre-requisite**
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	
1	U18MCI6201	Computer aided Manufacturing	Embedded - Theory & Lab	PC	3	0	2	0	4	U18MCI5202
2	U18MCI6202	Robotics Engineering	Embedded - Theory & Lab	PC	3	0	2	0	4	-
3	U18MCI6203	Microcontroller and Embedded Systems	Embedded - Theory & Lab	PC	2	0	2	0	3	U18MCT4003
4	U18MCE00**	Professional Elective I	Theory	PE	3	0	0	0	3	-
5	U18INI6001	Professional Communication and Analytical Reasoning	Theory	HS	3	0	0	0	3	-
6	U18MCO0***	Open Elective II	Theory	OE	3	0	0	0	3	-
								Total Credits		20
								Total Contact Hours/week		23

Semester VII										**Pre-requisite**
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	

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1	U18MBT7001	Engineering Economics and Financial Management	Theory	HS	3	0	0	0	3	-
2	U18MCT7001	Autonomous Vehicle	Theory	PC	3	0	0	0	3	-
3	U18MCT7002	Vision systems	Theory	PC	3	0	0	0	3	-
4	U18MCE00**	Professional Elective II	Theory	PE	3	0	0	0	3	-
5	U18MCE00**	Professional Elective III	Theory	PE	3	0	0	0	3	-
6	U18MCP7701	Project – Phase I	Project	PW	0	0	0	6	3	
								Total Credits	18	
								Total Contact Hours/week	21	

Semester VIII									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	U18MCP8701	Project – Phase II	Project	PW	0	0	0	24	12
								Total Credits	12
								Total Contact Hours/week	24

Total Credits	160

Mandatory Courses

Sl. No.	**Course code**	**Course Title**	**Course Mode**	**CT**	**Sem.**
1	U18VEP1501	Personal Values	Workshop	HS	1
2	U18INT2000	Constitution of India	Theory	MC	2
3	U18VEP2502	Interpersonal Values	Workshop	HS	
4	U18VEP3503	Family Values	Workshop	HS	3
5	U18CHI4000	Environmental Science and Engineering	Theory	MC	4
6	U18VEP4504	Professional Values	Workshop	HS	
7	U18VEP5505	Social Values	Workshop	HS	5
8	U18VEP6506	National Values	Workshop	HS	6
9	U18VEP7507	Global Values	Workshop	HS	7

Programme Electives

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S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C
Mechatronics Systems									
1	U18MCE0001	Automotive Electronics	Theory	PE	3	0	0	0	3
2	U18MCE0002	Condition Monitoring	Theory	PE	3	0	0	0	3
3	U18MCE0003	Micro Electro Mechanical Systems	Theory	PE	3	0	0	0	3
Computational Intelligence									
1	U18MCE0004	Artificial Intelligence and Machine Learning	Theory	PE	3	0	0	0	3
2	U18MCE0005	Database Management System	Theory	PE	3	0	0	0	3
3	U18MCE0006	Soft Computing	Theory	PE	3	0	0	0	3
Design and Manufacturing									
1	U18MCE0007	Smart Manufacturing	Theory	PE	3	0	0	0	3
2	U18MCE0008	Statistical Quality Control	Theory	PE	3	0	0	0	3
3	U18MCE0009	Composite and Smart Materials	Theory	PE	3	0	0	0	3
	U18MCE0010	Additive Manufacturing	Theory	PE	3	0	0	0	3

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SEMESTER I

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U18MAI1201 LINEAR ALGEBRA AND CALCULUS
(Common to All branches- 2019 batch onwards)

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, apply Cayley Hamilton theorem to Matrix Manipulation and apply orthogonal diagonalisation to convert quadratic form to canonical form.
CO2: Apply suitable techniques of differentiation and integration to various functions and identify the maxima and minima of functions of one variable.
CO3: Solve first order ordinary differential equations and apply them to certain physical situations.
CO4: Solve higher order ordinary differential equations arising in real world situations.
CO5: Evaluate the total derivative of a function, expand the given function as series and locate the maximum and minimum for multivariate functions.
CO6: Determine Rank, Inverse, Eigenvalues, Eigenvectors of the given matrix, solve Differential equations and locate Maxima-Minima of the function 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	M	M
CO2	S	S			M				M	M		M	M	M
CO3	S	S			M				M	M		M	M	M
CO4	S	S			M				M	M		M	M	M
CO5	S	S			M				M	M		M	M	M
CO6	S	S			M				M	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

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THEORY COMPONENT

MATRICES **11 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) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

DIFFERENTIAL AND INTEGRAL CALCULUS **9 Hours**

Representation of functions -Limit of a function-Continuity -Derivatives -Differentiation rules - Maxima and Minima of functions of one variable - Definite and Indefinite integrals - Techniques of Integration: Substitution rule, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction.

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS **6 Hours**

Leibnitz's equation – Bernoulli's equation –Applications: Orthogonal trajectories and Electric Circuits.

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS **9 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: Electric Circuits.

FUNCTIONS OF SEVERAL VARIABLES **10 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.

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. G.B.Thomas and R.L.Finney, Calculus and Analytical Geometry, 11th Edition, Pearson Education, (2006)

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9. James Stewart, Calculus: Early Transcendentals, Cengage Learning, 7th Edition, New Delhi, 2015.

WEBSITES

1. https://www.khanacademy.org/tag/maxima-and-minima-math
2. https://www.khanacademy.org/math/differential-calculus
3. https://www.khanacademy.org/math/integral-calculus

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.
5. Eigenvalues and Eigenvectors of Higher Order Matrices
6. Curve tracing
7. Differentiation and Integration
8. Solving first and 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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U18CHI1201	ENGINEERING CHEMISTRY (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: 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	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	S	M												
CO2	S	M		M										
CO3	S	M		S										M
CO4	S	M		S										S
CO5	M	S		S										

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

Theory Component

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.

THERMODYNAMICS **7 Hours**

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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 **6 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 **9 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 **9 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

REFERENCES

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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.

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U18ENI1201 – FUNDAMENTALS OF COMMUNICATION-I
(Common to all Branches of I Semester B.E/B/Tech Programmes)

L	T	P	J	C
2	0	2	0	3

Course Objectives:

1. To communicate effectively by using appropriate grammar and technical parlance in a range of academic scenarios.
2. To interpret and critically evaluate discourses related to functional English.
3. To disseminate professional information through appropriate means of communication.

Course Outcomes:

After the course the student will be able to:

CO1: Communicate in English with correct grammar
CO2: Communicate effectively (Oral and Written)
CO3: Use communication skills in the real world

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)												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1										S		S		
CO2		M		W		W			M	S		S		
CO3		M		M		W			M	S		S		

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No	Topic	Hours
MODULE I - 12 Hrs		
1.1	Parts of Speech	2
1.2	Subject Verb Agreement	2
1.3	Speak up (Self Introduction, JAM)	4
1.4	Writing sentences using 'Be-forms'	3
1.5	Test	1
MODULE II - 12Hrs		
2.1	Articles, Gerunds, Infinitives	2
2.2	Speak up (Greetings & Polite English)	4
2.3	Dialogue Writing	3
2.4	Skimming & Scanning	2
2.5	Listening Skills - I	1
MODULE III - 12 Hrs		
3.1	Tenses & Voice	2
3.2	Sentences & its kinds	2
3.3	Speak up (Narration & Description)	4
3.4	Summarizing & Note-making	3
3.5	Listening Skills - II	1
MODULE IV - 12 Hrs		
4.1	Framing Questions – 4 types	2
4.2	Speak up (Role play)	4
4.3	Letter writing – Formal and Informal & Email Writing	3
4.4	Reading Comprehension & Cloze test	2
4.5	Listening Skills - III	1
MODULE V - 12 Hrs		
5.1	Degrees of Comparison	2
5.2	Clauses	2
5.3	Speak up (Power Point Presentation)	4
5.4	Writing (Picture perception)	3
5.5	Test	1
Total		**60**

Reference:

1. A Modern Approach to Non Verbal Reasoning (English, Paperback, Dr. R S Aggarwal)
2. The Power of Words(Bloomsbury, UK, 2012, Hyacinth Pink)
3. Word Power Made Easy: The Complete Handbook for Building a Superior Vocabulary (By Norman Lewis)
4. Effective Technical Communication Tata Mc Graw Hills Publications (Ashraf Rizvi)
5. English and Soft skills Orient Black Swan Publishers (S. P. Dhanavel)
6. Know Your Grammar: Trans.in Tamil & Malayalam –A Bilingual Approach (Bloomsbury, UK, 2012, Hyacinth Pink)

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U18MEI1201 ENGINEERING GRAPHICS

L	T	P	J	C
2	0	2	0	3

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

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	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	S	S									W	
CO3	S	S									M	
CO4	S	S										
CO5	S	S										
C06	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 10 Hours

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 **10 Hours**

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 **10 Hours**

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.

INTRODUCTION TO AUTOCAD **15 Hours**

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 **15 Hours**

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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L	T	P	J	C
2	0	2	0	3

U18CSI1202 PROBLEM SOLVING AND PROGRAMMING USING C

COURSE OUTCOMES

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

CO1: Acquire knowledge on different problem-solving techniques.
CO2: Use appropriate data types and control structures for solving a given problem.
CO3: Execute different array and string operations.
CO4: Experiment with the usage of pointers and functions.
CO5: Organize data using structures and unions.

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
CO1	S	M							L			
CO2	S	M							L	L		
CO3	S	L			L	L			L	L		L
CO4	M	L	M	L	L	L			L	L		M
CO5	M	L	M	L	L	L			L	L		M

COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II (Theory Component) 2. Assignment (Theory Component) 3. Group Presentation (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 component)
INDIRECT
1. Course-end survey

THEORY COMPONENT CONTENTS

STRUCTURED PROGRAMMING **6 Hours**

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Algorithms, building blocks of algorithms (instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration). Introduction to C Programming – Operators and Expressions – Data Input and Output – Control Statements.

ARRAYS AND STRINGS **6 Hours**

Defining an array – Processing an array –Multidimensional Arrays Character Arithmetic – Defining a string – Initialization of Strings – Reading and Writing Strings – Processing Strings –Searching and Sorting of Strings

FUNCTIONS, STORAGE CLASSES **6 Hours**

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

POINTERS **7 Hours**

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

STRUCTURES AND UNIONS **5 Hours**

Structures and Unions: Defining a Structure – Processing a Structure – User defined data types (Typedef) – Unions

Theory: 30	Tutorial: 0	Practical: 0	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. Pradip Dey and Manas Ghosh, “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. Reema Thareja, “Programming in C”, Second Edition, Oxford University Press, 2011.

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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
9. Programs on pointer operators, call by reference, pointers with arrays
10. Programs using structures and unions.

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. Pradip Dey and Manas Ghosh, "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:

1. -

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 First semester, students will focus primarily on IOT with C programming using Arduino

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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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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	Programme Outcomes(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.
5.Fitness: Simplified physical exercises – Sun salutation - Lung strengthening practices: Naadi suddhi pranayama – Silent sitting and listening to nature – Meditation.

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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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U18MAI2201 **ADVANCED CALCULUS AND LAPLACE TRANSFORMS**
(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	M	M
CO2	S	S			M				M	M		M	M	M
CO3	S	S			M				M	M		M	M	M
CO4	S	S			M				M	M		M	M	M
CO5	S	S			M				M	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)
5. End Semester Examination (Theory and lab component)

INDIRECT

1. Course-end survey

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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.

LAB COMPONENT **30 Hours**

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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

COs	Programme Outcomes (POs)												PSO	
	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

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1. Continuous Assessment Test I, II (Theory component) 2. Cooperative learning report, Assignment; Group Presentation, Project report, Poster preparation, 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 optial fibre.
    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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U18ENI2201 FUNDAMENTALS OF COMMUNICATION II
(Common to all branches of Engineering and Technology)

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)**												**PSO**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1		W		S					S	S		S		
CO2				S					S	S		W		
CO3				M					S	S		S		

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

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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)

Theory: 30	**Tutorial: 0**	**Practical: 15**	**Project: 0**	**Total: 45 Hours**

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U18MET2003 ENGINEERING MECHANICS

L	T	P	J	C
3	0	0	0	3

Course outcomes

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

CO1: Apply the fundamental concepts in determining the effect of forces on a particle.

CO2: Make use of various principles in the determination of effect of forces in a rigid body.

CO3: Determine the geometry dependant properties of solids and sections

CO4: Solve problems in static friction.

CO5: Identify motion and determine the velocity and acceleration of a particle.

CO6: 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)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	S						W						M	
CO2	S						W						M	
CO3	S						W						M	
CO4	M						W						M	
CO5	M						W						M	
CO6	M						W						M	

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.

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 DEPENDANT 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 **6 Hours**

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

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KINEMATICS OF PARTICLES **6 Hours**

Kinematics – Rectilinear and curvilinear motion – projectile motion

KINETICS OF PARTICLES **6 Hours**

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

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.
3. J.L. Meriam & L.G. Karige, Engineering Mechanics: Statics (Volume I) and Engineering Mechanics: Dynamics (Volume II), 7th edition, Wiley student edition, 2013.
4. P. Boresi& J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
5. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
6. Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics-Statics and Dynamics", Vikas Publishing House Pvt. Ltd., New Delhi, 2006

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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.(K4,S3)
CO2:	Experiment with the various control statements in Python.(K3,S2)
CO3:	Develop Python programs using functions and strings.(K3,S2)
CO4:	Analyze a problem and use appropriate data structures to solve it.(K4,S3)
CO5:	Develop python programs to implement various file operations and exception handling.(K3,S2)

Pre-requisites :Nil

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

COs	PROGRAMME OUTCOMES (POs)												PSO	
	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PS O1	PS O2
CO1		S			M					M		M		
CO2			M							M		M		
CO3			M							M		M	M	
CO4	S	S	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
1. Course-end survey

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.

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CONTROL STATEMENTS AND FUNCTIONS IN 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 Namdev Kamthane, 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
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.

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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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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:

-

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 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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U18INT2000

CONSTITUTION OF INDIA

(Mandatory course)

L	T	P	J	C
2	0	0	0	0

Course Outcomes:

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

CO1: Gain Knowledge about the Constitutional Law of India
CO2: Understand the Fundamental Rights and Duties of a citizen
CO3: Apply the concept of Federal structure of Indian Government
CO4: Analyze the Amendments and Emergency provisions in the Constitution
CO5: Develop a holistic approach in their life as a Citizen of India

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
CO1						M			W			S
CO2						S		S				M
CO3									M	S		W
CO4								W	M			M
CO5						M		M				S
CO6												

Course Assessment methods

Direct
3. Group Activity / Quiz/ Debate / Case studies 4. Class test / Assignment
Indirect
Surveys

THEORY COMPONENT:

Module.1: Introduction to Indian Constitution **4 hours**

Meaning of the constitution law and constitutionalism - Historical perspective of the Constitution - Salient features and characteristics of the Constitution of India

Module.2: Fundamental Rights **8 hours**

Scheme of the fundamental rights - Right to Equality - Fundamental Right under Article 19 - Scope of the Right to Life and Liberty - Fundamental Duties and its

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legal status - Directive Principles of State Policy – Its importance and implementation

Module.3: Federal Structure **8 hours**

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India - The constitutional powers and status of the President of India

Module.4: Amendment to Constitution **6 hours**

Amendment of the Constitutional Powers and Procedure - The historical perspectives of the constitutional amendments in India

Module.5: Emergency Provisions **4 hours**

National Emergency, President Rule, Financial Emergency
Local Self Government – Constitutional Scheme in India

Total **30 hours**

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

REFERENCES

1. Constitution of India - Ministry of Law & Justice – PDF format
   awmin.nic.in/coi/coiason29july08.pdf
2. Introduction to the Constitution of India by Durgadas Basu
3. The Constitution of India – Google free material -
   www.constitution.org/cons/india/const.html
4. Parliament of India – PDF format
   download.nos.org/srsec317newE/317EL11.pdf
5. The Role of the President of India – By Prof.Balkrishna
6. Local Government in India – E Book - Pradeep Sachdeva
   https://books.google.com/books/.../Local_Government_in_In...

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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.
4.Pathway to Blissful life :

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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 (Common to AE/AUE/CE/ME/MCE/EEE)	L	T	P	J	C
		3	1	0	0	4

Course Outcomes:

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

CO1	form partial differential equations and solve certain types of partial differential equations.
CO2	know how to find the Fourier Series and half range Fourier Series of a function
CO3	know how to solve one dimensional wave equation, one dimensional heat equation in steady state using Fourier series
CO4	apply Fourier Series to solve the steady state equation of two-dimensional heat equation in Cartesian coordinates.
CO5	Apply the Fourier transform, Fourier sine and cosine transform to certain functions and use Parseval's identity to evaluate integrals.
CO6	Evaluate Z – transform for certain functions. Estimate Inverse Z – transform of certain functions and to solve difference equations using them.

Pre-requisite:

-

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	M		S	M	M
CO2	S	M		M									W	W
CO3	S	S	S		S				M	M		S	W	W
CO4	S	M	M									M	W	W
CO5	S	M	M		S								W	W
CO6	S	S			S				M	M		S		

Course Assessment methods:

Direct	Indirect
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	Course end survey

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**

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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 Hours **Tutorial : 15 Hours** **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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U18MCI3201

ELECTRONIC DEVICES AND CIRCUITS

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	Use passive elements and basic theorems to solve electric circuits.	**K3**
CO2	Understand the basic principles of semiconductor devices.	**K2**
CO3	Use diode to construct regulators, rectifiers and other applications.	**K2**
CO4	Analyze small signal amplifiers and oscillators constructed using transistors.	**K4**
CO5	Apply op-amp to construct various applications.	**K3**

Pre-requisite:

-

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	M		S	M									S	S
CO4	S	S		S									M	
CO5	M		S	M									S	S

Course Assessment methods:

Direct	Indirect
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	Course end survey

CIRCUIT THEORY INTRODUCTION **9 Hours**

Network Theorems: Kirchhoff's laws – Thevenin's theorem - Norton's theorem - Superposition theorem – Maximum power transfer theorem – Nodal and Mesh Analysis

THEOREMS AND ABSTRATION **9 Hours**

PN junction – diode equation (Derivation not required) – forward and reverse bias – Diode dc and ac resistances – Zener diode – Bipolar Junction Transistor – CE, CB and CC configurations– Biasing of a transistor; fixed bias, self-bias – FET – Common source and drain characteristics of JFET and MOSFET.

APPLICATION OF DIODES **9 Hours**

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Half Wave rectifier and Full Wave rectifiers – Filters with Capacitor and Inductors - Clippers and Clampers – Voltage Multipliers – Voltage regulators – Zener, series and shunt types.

AMPLIFIERS AND OSCILLATORS **9 Hours**

Common Emitter configuration - h parameter model for low frequencies – Small signal amplifiers - cascading amplifiers, differential amplifier – Oscillators – Barkhausen stability criterion - Hartley oscillators and Colpitts oscillators.

OPERATIONAL AMPLIFIERS **9 Hours**

Ideal characteristics – Inverting, Non-inverting – summer – Comparator, Integrator, differentiator – Schmitt trigger – R.C. Phase shift oscillator, Wein Bridge Oscillator – Astable multivibrator

Theory: 45 Hours **Practical: 30 Hours** **Total Hours: 75**

REFERENCES:

1. Agarwal, Anant, and Jeffrey H. Lang. Foundations of Analog and Digital Electronic Circuits. San Mateo, CA: Morgan Kaufmann Publishers, Elsevier, July 2005. ISBN: 9781558607354 (Unit: 1, 2, 3, 4, 5)
2. Albert Malvino and Bates J., Electronic Principles, Tata McGraw- Hill Pub. Company Ltd., 7th edition, 2008
3. Millman J., Halkias C.C. and Satyabrata Jit, Electronic Devices and Circuits, Tata McGraw Hill, New Delhi, 2nd edition, 2008.
4. Thomas L. Floyd, Electronic Devices, Pearson Education Asia, 5th edition, 2001.
5. William Hayt, Kemmerly J. and Durban S.M., Engineering Circuit Analysis, McGraw Hill Education, 2011.
6. Sudhakar, Shyammohan and Palli S., Circuits and Networks: Analysis & Synthesis, Tata Mc Graw Hill, New Delhi, 4th edition, 2010.
7. Salivahanan S., Suresh kumar N. and Vallavaraj A., Electronic Devices and Circuits, Tata Mc Graw Hill publishing company, New Delhi, 2nd edition, 2008
8. Roy Chowdhury D. and Jain Shail B., Linear Integrated Circuits, New Age Int. Pub., 4th edition, 2010.

LIST OF EXPERIMENT:

1. Characteristics of PN junction diode and Zener diode
2. Input and Output characteristics of BJT
3. Characteristics of JFET
4. Frequency response of CE amplifier
5. Clipper and Clamper
6. Phase shift and Wein Bridge oscillators using OP-AMP
7. Astable multivibrator using OP-AMP
8. Voltage Regulator (Zener diode, Transistor series and shunt)
9. Half-wave and Full-wave Rectifier with and without filter.
10. Printed Circuit Board design using software for simple circuits.

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U18MCI3202 ELECTRICAL MACHINES

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	Describe the construction, principle of operation and performance of DC motors.	**K2**
CO2	Elucidate the construction, principle of operation and performance of Induction Machines	**K2**
CO3	Summarize the speed control methods of electrical machines	**K2**
CO4	Explain the construction, principle of operation and performance of special machines and permanent magnet machines	**K2**
CO5	Select suitable motor for simple applications	**K3**

Pre-requisite:

-

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

COs	Programme Outcomes(POs)													
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	M		M										M	
CO2	M												M	
CO3	M												M	
CO4	M		M										M	
CO5											M		M	

Course Assessment methods:

Direct	Indirect
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	Course end survey

DC MACHINES **12 Hours**

DC machines: Principle of working -Construction, -Types of DC machines based on construction-Back emf, voltage equations, torque equation-Characteristics of DC motors - Speed control of DC series and Shunt motors -Armature and Field control.

AC MACHINES **12 Hours**

Three phase induction motor: Principle of working -construction - Production of RMF - Torque-slip characteristics, torque equation - cogging – crawling - Speed control of three phase induction motor -Voltage Control-Voltage/frequency control-slip power recovery scheme.

PERMANENT MAGNET MACHINES **6 Hours**

PMDC motors: Construction, principle of operation

Permanent magnet and variable reluctance type: Construction, principle of operation.

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BLDC motors: Construction, principle of operation.

SPECIAL MACHINES **6 Hours**

Stepper motors: Construction, principle of operation

Servo motors: Types of servo motors -Servo Mechanism-Construction of AC and DC servo Motors

SELECTION OF A MOTOR **9 Hours**

Factors influencing the selection of a motor - Motor Application Requirements – Velocity profiles – Current Density – Heat flow in a Motor - Fatigue and Lubrication tests – trends in test automation

CASE STUDY: Selection of a motor for an industrial application.

Theory: 45 Hours **Practical: 30 Hours** **Total Hours: 75**

REFERENCES:

1. Theraja B.L and Theraja A.K , "A Textbook of Electrical Technology", Volume 2: AC and DC machines, student edition, S.Chand Publications, 2013.
2. Janardanan E G., "Special Electrical Machines" PHI Learning Private Limited, Delhi, 2014.
3. Nagrath I J and Kothari DP., "Electrical Machines", 3rd Edition, Tata McGraw-Hill, New Delhi, 2006.
4. Pillai SK, "A first course on Electric drives", Wiley Eastern Limited, 1998.
5. Stephen Chapman, "Electric Machinery Fundamentals", McGraw-Hill Series in Electrical and Computer Engineering 4th edition, 2005
6. Univ.-Prof. Dr.-Ing., Dr. H.C. Gerhard Henneberger , "Electrical Machines I Basics, Design, Function, Operation" ,Aachen University, 2002.

LIST OF EXPERIMENT:

1. Study of two point starter
2. Study of three point starter
3. Load test on DC series motors
4. Load test on DC Shunt motor
5. Speed control of DC shunt motor using Armature Control
6. Speed control of DC shunt motor using Field Control
7. Open circuit characteristics of DC Generator
8. Load Test on Three Phase Squirrel Cage Induction motor
9. Speed control of three phase slip ring induction motor

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U18MCT3103 MECHANICS OF SOLIDS

L	T	P	J	C
3	1	0	0	4

Course Outcomes

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

- **CO1:** Recognize the elastic response of the materials and calculate the stresses and deflection in simple and compound bars
- **CO2:** Calculate the thermal stresses and the material response due to temperature variations
- **CO3:** Find the stresses in bi-axial load system and strain energy for different loads
- **CO4:** Develop the shear force, bending moment diagram and locate maximum values of shear force and bending moments induced in various types of beams
- **CO5:** Estimate the slope and deflection of beams under various loading conditions and crippling load for a column with different end conditions
- **CO6:** Determine the power transmitting, torque carrying capacities of the circular shafts and required thickness of the pressure vessel for a given internal pressure

Pre-requisite

1. U18MET2001 Engineering Mechanics

CO/PO Mapping

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

COs	Programme Outcomes(POs)													
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PS O2
CO1	M		M										S	M
CO2	S		M										S	M
CO3	M		M										S	
CO4	M		M										S	W
CO5	S		M										S	W
CO6	S		S										S	M

Course Assessment methods:	
Direct	**Indirect**
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	Course end survey

ELASTIC RESPONSE OF MATERIALS **12 Hours**

Introduction to elastic response – stresses (tensile, compressive, shear & bending) & strength – strain and deformation, stress-strain curve for steel

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Stresses and deformation of simple and compound bars under axial loads - Elastic constants and their relations-Thermal stresses and creep.

BI-AXIAL STRESSES AND STRAIN ENERGY **12 Hours**

Principal stresses – Introduction, significance, calculation of principal stresses - Mohr's circle to find principal stresses

Strain energy in gradually applied loads, suddenly applied loads and Impact loads

STRESSES IN BEAMS **12 Hours**

Types of beams: supports and loads – Cantilever, Simply supported and Overhanging beams - Shear force and bending moment diagrams.

Stresses in beams – theory of simple bending and its applicability for actual conditions effect of shape of beams on stress induced - Bending stress and flexural strength.

DEFLECTION OF BEAMS **12 Hours**

Elastic curve– Evaluation of beam: Double integration method & Macaulay's method

Columns: End conditions, equivalent length – Euler's equation and its limitations – slenderness ratio – Rankine's formula for columns

TORSION OF CIRCULAR SECTIONS AND DESIGN OF PRESSURE VESSELS **12 Hours**

Analysis of torsion of circular bars – shear stress distribution – twist and torsional stiffness – Bars of solid and hollow circular sections

Thin cylinders and shells – Hoop stress and longitudinal stresses.

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

REFERENCES:

1. Ramamrutham S, "Strength of materials", 14th Edition, Dhanpat Rai Publishing Company, 2014.
2. Rattan S S, "Strength of materials", 2nd edition, McGraw Hill, 2014.
3. Ferdinand Beer and Russell Johnston Jr., "Mechanics of materials", 3rd edition, Tata McGraw Hill 2007.
4. Nash W A, "Strength of materials", 4th edition, Tata McGraw Hill, 2011.
5. RC hibbeler, "mechanics of materials", 9th edition, Pearson, 2014.

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U18MCT3104 **FLUID MECHANICS AND THERMAL SCIENCES**

L	T	P	J	C
3	1	0	0	4

Course Outcomes

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

- **CO1:** Describe the properties of fluids and its importance in selection of fluid for suitable application.
- **CO2:** Apply the concept of fluid statics to determine the pressure and forces on plane and curved surfaces.
- **CO3:** Differentiate the types of flow with its characteristics and also calculate the flow rate by applying concept of fluid kinematics and dynamics.
- **CO4:** Identify the major and minor losses involved in the fluid flow through pipes.
- **CO5:** Explain the concept of boundary layer and methods of preventing the boundary layer separation.
- **CO6:** Summarize the laws of thermodynamics and concept of heat transfer mechanisms in energy interactions.

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													
CO2	S													W
CO3	S	M												W
CO4	S	S												W
CO5	W													
CO6	M				W									W

Course Assessment methods:	
Direct	**Indirect**
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	1. Course end survey

PROPERTIES OF FLUIDS AND FLUID STATICS

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14 Hours

Fluid - definition, distinction between solid and fluid - Units and dimensions – Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapor pressure, capillary and surface tension.

Fluid statics: Pascal law - Hydrostatic law - Pressure measurements using Manometers and pressure gauges - Forces on immersed plane and curved surfaces – Buoyancy – Meta-centre - Stability of floating and submerged bodies.

FLIUD KINEMATICS AND FLUID DYNAMICS **10 Hours**

Fluid Kinematics – Types of flow - velocity and acceleration - continuity equation.

Fluid dynamics - equations of motion - Euler's equation along streamline - Bernoulli's equation – Applications - Venturi meter, Orifice meter, Pitot tube.

FLUID FLOW AND BOUNDARY LAYER CONCEPTS **12 Hours**

Hagen Poiseuille Equation - Darcy Welsbach equation - Friction factor – Major and minor energy losses - Flow through pipes in series and in parallel.

Types of Boundary layer thickness – Boundary layer separation – Methods of preventing the boundary layer separation.

LAWS OF THERMODYNAMICS **12 Hours**

Zeroth law of thermodynamics – Measuring temperature, Thermal expansion, absorption of heat by solids and liquids. First law of thermodynamics – First law applied to flow and non-flow process. Second law of thermodynamics – Entropy.

HEAT TRANSFER MECHANISMS **12 Hours**

Heat transfer mechanisms: Conduction – Fourier's Law, thermal resistance. Convection – Newton's law of cooling. Radiation – Wien's law, Kirchhoff's law, Stefan-Boltzmann law. Heat exchangers – LMTD – NTU – Fins.

Theory: 45 Hours **Tutorial : 15 Hours** **Total Hours: 60**

REFERENCES:

1. White FM., "Fluid Mechanics", 7th Edition, Tata McGraw-Hill, New Delhi, 2011.
2. Cengel YA., Cimbala J M., "Fluid Mechanics – Fundamentals and applications", 2nd Edition, McGraw Hill higher education, 2010.
3. Modi PN., Seth SM., "Hydraulics and fluid mechanics including hydraulic machines", 20thedition, Standard publishers, 2015.
4. Bansal RK., "Fluid Mechanics and Hydraulics Machines", 9th edition, Laxmi publications (P) Ltd., New Delhi, 2011.
5. Ramamirtham S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2006.
6. Nag P.K., "Engineering thermodynamics", Tata McGraw hill, 2005.
7. Rajput R.K., "Heat and Mass transfer", S.Chand and Co Publishing, 2008.

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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:

-

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

GUIDELINES:

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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**

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: **30 hours**

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

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

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

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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U18MAT4101

NUMERICAL METHODS AND PROBABILITY

L	T	P	J	C
3	1	0	0	4

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

COURSE OUTCOMES

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

CO1 Apply the concepts of 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

CO4 differential equations by using numerical methods.

CO5 Apply the concepts of probability, conditional probability and total probability.

CO6 Analyze random or unpredictable experiments and investigate important features of random experiments.

Pre-requisite:

-

CO/PO Mapping

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

COs	Programme Outcomes(POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	S	S												
CO2	S	S												
CO3	S	S							M					
CO4	S	S											M	M
CO5	S	S							M				M	M
CO6	S	S												

COURSE ASSESSMENT METHODS

Direct	Indirect
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	1. Course Exit Survey

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SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS **9+3Hours**

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 NUMERICAL INTEGRATION **9+3Hours**

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+3Hours**

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

PROBABILITY **3+1Hours**

Measures of central tendency: Mean Median and Mode **–** Measures of variation – Range, standard deviation, Mean deviation and coefficient of variation - Correlation and Regression: Karl Pearson's coefficient of correlation –Rank Correlation – Regression lines.

RANDOM VARIABLES **6+2Hours**

Random variable – Distribution function – properties – Probability mass function - Probability density function – moments and moment generating function – properties.

STANDARD DISTRIBUTIONS **9+3Hours**

Binomial, Poisson and Normal distributions – Moments, Moment Generating functions and properties for the above distributions - Fitting of Binomial and Poisson distributions.

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.

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U18MCI4201 HYDRAULICS AND PNEUMATICS

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:** Describe the concept of fluid power and different types of fluid power systems.
- **CO2:** Explain the working principles of different types of hydraulic pumps.
- **CO3:** Discuss the working principles of different types of hydraulic actuators.
- **CO4:** Summarize the working principles of compressors and pneumatic components.
- **CO5:** Design hydraulic and pneumatic circuits for simple applications.
- **CO6:** Explain the concept of fluid logic control systems, maintenance of fluid power systems.

Pre-requisite

-

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	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	M													M
CO2	M	M												M
CO3	M													M
CO4	M													M
CO5	S	M			S								M	M
CO6	M													M

Course Assessment methods:	
Direct	**Indirect**
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	Course end survey

FUNDAMENTALS OF FLUID POWER **6 Hours**

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids. Fluid power symbols.

HYDRAULIC SYSTEM AND COMPONENTS **10 Hours**

Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tandem, Rodless, Telescopic - Construction and

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application. Cushioning mechanism, Rotary actuators - Gear, Vane and Piston motors - Selection of Pumps and actuators.

HYDRAULIC VALVES, ACCUMULATORS AND CIRCUITS **10 Hours**

Directional control valve – 3/2 way valve – 4/2, 4/3 way valve – Shuttle valve – check valve. Pressure control valves, Flow control valve – Fixed and adjustable, electrical control solenoid valves. Types of accumulators, Accumulators circuits, Intensifier – Circuit and Application, Speed control circuits, synchronizing circuit and industrial application circuits – copying circuit and press circuit.

PNEUMATIC SYSTEMS, COMPONENTS AND CIRCUITS **10 Hours**

Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves and pneumatic actuators. Pneumo hydraulic circuit, Sequential circuit design for simple applications using cascade method, Karnaugh – Veitch Mapping method.

FLUID LOGIC CONTROL SYSTEMS AND MAINTENANCE **9 Hours**

Hydro Mechanical servo systems, Electro-hydraulic and Electro-pneumatic systems and proportional valves. Fluidic Logic and switching controls - PLC applications in fluid power control, Maintenance - Failure and trouble shooting in fluid power systems.

Theory: 45 Hours **Practical 30 Hours** **Total Hours: 75**

REFERENCES:

1. Anthony Esposito, “Fluid Power with Applications”, Pearson Education Inc., 7th Edition 2014.
2. Majumdar S.R., “Pneumatic systems – Principles and maintenance”, Tata McGraw-Hill, 2009.
3. James A. Sullivan, “Fluid Power: Theory and Applications”, C.H.I.P.S, 4th edition, 2007.
4. Andrew Parr, “Hydraulics and Pneumatics ", Jaico Publishing House, 2005.
5. Srinivasan R, “Hydraulic and Pneumatic Controls”, McGraw Hill Education, 2008.

LIST OF EXPERIMENTS

1. Design and testing of the following hydraulic circuits:
    i. Pressure control
    ii. Flow control
    iii. Sequential circuit using an Electro hydraulic Trainer kit.
2. Design and testing of the following pneumatic circuits:
    i. Pressure control
    ii. Flow control
    iii. Circuits with logic controls
    iv. Circuits for multiple cylinder sequencing in Pneumatic, Electro pneumatic Trainer kits.
3. Simulation of basic hydraulic, pneumatic and electrical circuits using Automation Studio software.

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U18MCI4202 SENSORS AND INSTRUMENTATION

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:** Classify the transducers and instruments based on their working principles, characteristics and order of the system.
- **CO2:** Describe the working principle and characteristics of non-electrical transducers.
- **CO3:** Discuss about the construction, working principles and characteristics of bio medical sensors.
- **CO4:** Generate appropriate design procedure, suitable for signal conversion to interface with computer.
- **CO5:** Design appropriate circuits by using conventional formulas used in signal conditioning and conversion.
- **CO6:** Use sensors and transducers to create simple Mechatronics applications using data logging software

Pre-requisite

-

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	PSO 1	PSO 2
CO1	S			W									W	
CO2	S			M	M								M	
CO3	S			M	M								M	
CO4	S	M	S	S	M								S	M
CO5	M	M	S	S	M								S	M
CO6	M	M		S	S								S	

Course Assessment methods:

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	Course end survey

MEASUREMENT SYSTEMS **9Hours**

Generalized Measurement System – Performance Characteristics: Static and Dynamic Characteristics – Errors in Measurements – statistical Analysis of errors - Calibration and Standards – Generalized Performance of Zero Order, First Order and Second Order Systems – Classifications of Transducers.

MEASUREMENT OF NON-ELECTRICAL PARAMETERS-1 **9Hours**

Linear and angular displacement: Resistive, capacitive, inductive types and Optics (encoders), proximity sensors

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Velocity measurement: tachometers, tachogenerators and resolvers
Temperature measurement: Contact type: Bimetallic, RTD, Thermocouple and Thermistor **Non-Contact type:** Radiation Pyrometer – Optical Pyrometer
Humidity: Capacitive and resistive and hot and wet bulbs.
Other sensors: Fire, smoke and metal detectors.

MEASUREMENT OF NON-ELECTRICAL PARAMETERS-2 9Hours

Force measurement: Resistive type strain gauges: Bridge configurations, Temperature compensation, Load cells, Fiber optic strain gauge- Semiconductor strain gauges- Piezo electric transducers.
Vacuum Measurement: McLeod Gauge, Thermal Conductivity Gauge – Ionization Gauge.
Airflow: Anemometers
Light: UV, IR, Light emitter and detector
Introduction to Acoustics and acoustic sensors: Ultrasonic sensor- Types and working of Microphones and Hydrophones – Sound level meters- Nuclear radiation sensors.

MEASUREMENT OF BIO SIGNALS 9Hours

Basic transducer principles Types – source of bioelectric potentials - electrode – electrolyte interface, electrode potential, resting and action potential – electrodes for their measurement, ECG, EEG.

SIGNAL CONDITIONING AND DATA ACQUISITION 9Hours

Amplification, Filtering – Level conversion – Linearization - Buffering – Sample and Hold circuit – Quantization – Multiplexer / Demultiplexer – Analog to Digital converter – Digital to Analog converter- I/P and P/I converter - Instrumentation Amplifier-V/F and F/V converter- Data Acquisition -Data Logging – Data conversion – Introduction to Digital Transmission system.

Theory: 45 Hours Practical: 30 Hours Total Hours: 60

REFERENCES:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.
2. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.
3. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 2009
4. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12thedition, Dhanpat Rai & Co, New Delhi, 2013.

LIST OF EXPERIMENTS

1. Design and testing of Voltage to frequency converter and frequency to voltage converter
2. Design and testing of sample and hold circuit.
3. Displacement measurement using potentiometer and LVDT and plotting the characteristic curves.
4. Study of Characteristics and calibration of strain gauge and Load Cell
5. Measurement of strain using resistive type strain gauges with temperature compensation and various bridge configurations
6. Temperature measurement using Thermocouple, Thermistor and RTD and comparing the characteristics.
7. Comparison of capacitive and resistive type transducer for humidity measurement with their characteristics
8. Measurement of sound using microphones and sound level meter.
9. Measurement of temperature, strain, displacement, acceleration using NI DAQ and RIO cards.
10. Signal conditioning the physical signals using LABVIEW.

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U18MCT4003 **DIGITAL ELECTRONICS AND MICROPROCESSOR**

L	T	P	J	C
3	1	0	0	3

Course Outcomes

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

CO1: Use number systems, Boolean algebra and explain various digital logic families.

CO2: Apply basic logic gates to form simple circuits and can simplify logic circuits using K- Map technique.

CO3: Design various combinational and sequential circuits

CO4: Explain the architecture of 8085 microprocessor

CO5: Write assembly language program for 8085 for the given application.

CO6: Explain the memory Mapping and I/O devices.

Pre-requisite

-

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	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	M													
CO2	S	W	M										W	
CO3	M	S	S										M	M
CO4	M													M
CO5	M				S									S
CO6	M		S		S								M	S

Course Assessment methods:	
Direct	**Indirect**
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	Course end survey

NUMBER SYSTEMS, DIGITAL LOGIC FAMILIES AND BOOLEAN LOGIC **9 Hours**

Introduction to Number systems: Binary, Octal, Hexadecimal, BCD, Gray code, Excess 3 code - Binary arithmetic: 1's complements, 2's complements, and Code conversions -Digital Logic Families: TTL, CMOS, NMOS, ECL- Performance comparison of various logic families- Boolean algebra: Basic

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Postulates and theorems, switching functions, Canonical forms, Logic gates- Simplification using K-maps and Implementation using logic gates.

COMBINATIONAL CIRCUITS **9 Hours**

Problem formulation and design of combinational circuits: adder, subtractor, Parallel adder and Subtractor- Carry look ahead adder- BCD adder, Magnitude Comparator, parity checker Encoder , decoder, Multiplexer/ Demultiplexer , code converters, Function realization using gates and multiplexers. Implementation of Combinational circuits using Multiplexers and Demultiplexers- Memory: PROMs and PLAs.

SEQUENTIAL CIRCUITS **9 Hours**

General model of sequential circuits: Latch, Flip Flops, Level triggering, Edge triggering, Master slave configuration- Realization of one flip flop using other flip flop- Registers-Counters: Binary counters, Modulo–n counter, Decade, Counters, Ring counter and Johnson counter.

MICROPROCESSOR 8085 **9 Hours**

Organization of 8085: Architecture, Internal Register Organization and Pin Configuration – Instruction Set of 8085 – addressing modes - instruction and machine cycles with states and timing diagram - 8085 assembly language programming

MEMORY AND I/O INTERFACING **9 Hours**

Address space partitioning – address map – Address decoding – Designing decoder circuit for the given address map -I/O Interfacing- Peripheral ICs*: 8255, 8279 and 8251 A.

* Emphasis to be given on architecture with simple applications.

Theory: 45 Hours **Tutorials: 15 Hours** **Total Hours:45**

REFERENCES

1. Morris Mano M. and CilettiM D., “Digital Design”, 4th edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
2. Donald P Leach, Albert Paul Malvino and Gautam Saha, “Digital Principles and Applications”, 8th edition, Tata McGraw Hill Publishing Company Limited, New Delhi, Special Indian Edition, 2014.
3. Salivahanan S. and Arivazhagan S., “Digital Circuits and Design”, 5th edition, oxford university press, 2018.
4. Ramesh Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”, 6th edition, Penram International (India), 2013.
5. Aditya P Mathur, “Introduction to Microprocessor”, 3rd edition,Tata McGraw Hill, New Delhi, 2003.

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U18MCT4104 THEORY OF MACHINES

L	T	P	J	C
3	1	0	0	4

Course Outcomes

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

CO1: Apply concepts of mechanisms to achieve desired motion transformation
CO2: Choose appropriate gear train and friction drives for a given application
CO3: Calculate various forces acting on rigid bodies under static and dynamic conditions
CO4: Solve balancing problems related to rotating and reciprocating masses.
CO5: Apply the fundamental concepts of vibrating system to predict the natural frequency and force transmitted

Pre-requisite

-

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	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	S												S	M
CO2	M													M
CO3	M		M										M	
CO4	S		W										M	
CO5	S		W										M	

Course Assessment methods:

Direct	Indirect
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	Course end survey

ANALYSIS OF MECHANISMS **13 Hours**

Basic Elements of Mechanisms – Introduction to kinematic links, pairs, chain, machine and structure, degrees of freedom. Grashoff's law, Kutzback criterion. Kinematic inversions of four-bar and slider crank chain. Classifications of cam and follower, terminologies, follower motion.
Velocity and acceleration analysis for Four bar chain and single slider crank mechanism.

GEAR AND FRICTION DRIVES **12 Hours**

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Gear and Friction drives - Fundamentals of toothed gearing, spur gear terminology. Involute gear tooth profile. Gear meshing, contact ratio. Gear trains, simple compound gear trains and epicyclic gear train. Belt, Clutch (Including Problems) – Screw and Brake (Concept only).

FORCE ANALYSIS **12 Hours**

Rigid Body dynamics in general plane motion – Equations of motion.- Static force analysis – D'Alemberts principle –The principle of superposition – Inertia force and Inertia torque – Introduction to Dynamic Analysis in Reciprocating Engines.

BALANCING **9 Hours**

Introduction, static and dynamic. Balancing of single mass rotating in single plane. Balancing of several masses rotating in single plane. Balancing of several masses rotating in different planes. Introduction to Balancing of reciprocating masses, Hammer blow, Swaying couple, Tractive force.

VIBRATION **14 Hours**

Types of vibration, frequency of undamped and damped system. Response to periodic forcing - Harmonic Forcing - Forcing caused by unbalance-Support motion - Force transmissibility and amplitude transmissibility - Vibration isolation.

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

REFERENCES:

1. Rattan SS., "Theory of Machines", 5th Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2014.
2. R.L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw Hill Publishing Company Ltd.,2014.
3. R.K. Bansal, "Theory of Machines", Lakshmi publications pvt.ltd., 2011
4. Singiresu S.Rao, "Mechanical Vibrations", Pearson, 2017.
5. Thomas Beven, "Theory of Machines", CBS Publishers and Distributors, 3rd edition, 2013.
6. Gordon R, Pennock & Joseph E. Shigley John J. Ulicker, " Theory of Machines and Mechanisms", Oxford Higher Education, 2014.

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

Pre-requisite:

-

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

GUIDELINES:

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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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U18CHT4000 Environmental Science and Engineering (Common to All branches)

L	T	P	J	C
3	0	0	0	0

Course Outcomes

After successful completion of this course, the students 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: Consider issues of environment and sustainable development in his/her 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.

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	PO 10	PO 11	PO 12
CO 1		M					S		M			
CO 2						M				M		
CO 3							M					
CO 4						M	S					
CO 5							S					
CO 6			W				S					M

Course Assessment methods

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

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

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, 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.

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Energy resources: Growing energy needs, renewable and nonrenewable 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 – Bio geographical 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 **8 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 Production 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.

HUMAN POPULATION AND THE ENVIRONMENT **7 Hours**

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

Theory: 45 Hours **Total: 45 Hours**

REFERENCES

1. G. Tyler Miller and Scott Spoolman, 'Environmental Science', Fourteenth Edition, Brooks Cole, 2012.
2. Gilbert M. Masters and Wendell P. Ela, 'Introduction to Environmental Engineering and Science', Third Edition, Pearson Education, 2013.
3. Bharucha Erach, 'The Biodiversity of India', Mapin Publishing Pvt. Ltd., Ahmedabad, 2002.

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4. Trivedi R.K and P.K.Goel, 'Introduction to Air Pollution', Techno-Science Publications, 2003.
5. Trivedi R.K., 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media, 1996.
6. Cunningham, W.P.Cooper and T.H.Gorhani, 'Environmental Encyclopedia', Jaico Publication House, Mumbai, 2001.
7. Wager K.D., 'Environmental Management', W.B. Saunders Co., Philadelphia, USA, 1998.
8. Colin R. Townsend, Michael Begon and John L. Harper, 'Essentials of Ecology', Third Edition, Blackwell Publishing, 2008.

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U18VEP4504 PROFESSIONAL VALUES

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. U187VEP3503 / FAMILY 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			S											
CO4												S		
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: 30 hours

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

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

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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

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

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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