w.e.f. 2017-18

VR17

B. Tech.

ELECTRICAL AND ELECTRONICS ENGINEERING

SYLLABUS

Department of Electrical and Electronics Engineering

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2008 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A' Grade, Affiliated to JNTUK, Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

PROGRAMME OUTCOMES

PO1: An ability to apply knowledge of mathematics, science, and engineering.

PO2: ability to design and conduct experiments as well as analyse and interpret data.

PO3: An ability to design an integrated system and its various components and processes, within desired needs.

PO4: An ability to function effectively individually and on teams, including diverse and Multi-disciplinary, to accomplish a common goal.

PO5: An ability to identify, evaluate and solve engineering problems.

PO6: An understanding of the responsibility of engineers to practice in professional and Ethical manner at all times.

PO7: An ability to communicate effectively using oral, written, and graphic forms

PO8: The broad education necessary to understand the potential impact of engineering Solutions on society and the environment.

PO9: An understanding of the need for up-to-date engineering tools and other knowledge acquired through lifelong learning.

PO10: Knowledge of contemporary issues related to engineering.

PO11: An ability to use modern engineering tools, skills and design techniques necessary for the practice of engineering.

PO12: An understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects.

PROGRAMME SPECIFIC OUTCOME

PSO1: Understand analyze and design systems that efficiently generate, transmit, distribute and utilize electric power.

PSO2: To expertise in the technology associated with efficient conversion and control of electrical power by static means from available form to the required form.

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION FOR FIRST YEAR UG PROGRAMME

SEMESTER I

S.No	Course Code	Course	L –T - P	Credits
1.	17MA1101	Matrices and Differential Calculus	3-1-0	4
2.	17CH1102	Engineering Chemistry	3-0-0	3
3.	17CS1103	Problem Solving Methods	2-1-0	3
4.	17ME1104A/ 17ME1104B	Engineering Mechanics – I (ME and CE) Mechanics for Engineers (EEE)	3-0-0	3
5.	17ME1105	Engineering Graphics	2-0-4	4
6.	17CH1151	Engineering Chemistry Laboratory	0-0-3	1.5
7.	17CS1152	Computing and Peripherals Laboratory	0-0-2	1
			Total	19.5
8.	17MC1106	Professional Ethics & Human Values	2-0-0	-

SEMESTER II

S.No	Course Code	Course	L – T – P	Credits
1.	17MA1201	Laplace Transforms and Integral Calculus	3-1-0	4
2.	17PH1202	Engineering Physics	3-0-0	3
3.	17CS1203	Programming in C	3 -0-0	3
4.	17ME1204 17EE1204	Engineering Mechanics – II (ME and CE) Network Analysis-1 (EEE)	3-0-0	3
5.	17HS1205	Technical English and Communication Skills	2-0-2	3
6.	17PH1251	Engineering Physics Laboratory	0-0-3	1.5
7.	17CS1252	Computer Programming Laboratory	0-0-3	1.5
8.	17ME1253	Basic Workshop	0-0-3	1.5
9.			Total	20.5
10.	17MC1206A	Technology and Society	1-0-0	-

L–Lecture,**T**– Tutorial, **P** –Practical, **C**-Credits

17MA1101

MATRICES AND DIFFERENTIAL CALCULUS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 2 - 0
Prerequisites:	Fundamentals of Matrices, Fundamentals of Calculus, Integration, Differentiation.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Determine Eigen values, Eigen vectors of a matrix.
CO2	Estimate Maxima and Minima of Multi Variable Functions.
CO3	Solve the Linear differential equations with constant coefficients.
CO4	Solve the Linear differential equations with variable coefficients.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**			**L**	**H**						**M**	
CO2	**H**			**L**	**H**						**M**	
CO3	**H**			**L**	**H**						**M**	
CO4	**H**			**L**	**H**						**M**	

COURSE CONTENT

UNIT I

Matrices: Rank of a Matrix, Elementary transformations, Inverse of a Matrix (Gauss Jordan Method), Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen values, Properties of Eigen values, Finding Inverse and Powers of a Matrix by Cayley-Hamilton Theorem. Reduction to Diagonal form, Reduction of Quadratic form to Canonical

form, Nature of a Quadratic form, Complex matrices.

UNIT II

Differential Calculus: Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's Theorem, Maclaurin's Series.

Application: Curvature, Radius of Curvature**.**

Functions of two or more Variables: Partial Derivatives, Change of Variables, Jacobians, Taylor's Theorem for Function of two Variables, Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.

UNIT III

Differential Equations of First Order: Formation of a Differential Equation, Solution of a Differential Equation, Linear Equations, Bernoulli's Equation, Exact Differential Equations, Equations Reducible to Exact Equations.

Applications: Orthogonal Trajectories, Newton's Law of Cooling.

Linear Differential Equations of Higher Order: Definitions, Operator D, Rules for Finding the Complementary Function, Inverse Operator, Rules for finding Particular Integral, Working Procedure to Solve the Equation.

UNIT IV

Linear Dependence of Solutions, Method of Variation of Parameters, Method of Undetermined Coefficients, Equations Reducible to Linear Equations with Constant Coefficients: Cauchy's Homogeneous Linear Equation, Legendre's Linear Equation, Simultaneous Linear Differential Equations with Constant Coefficients.

Applications: L-C-R Circuits.

TEXT BOOKS

[1] B.S.Grewal , "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2014.

REFERENCE BOOKS

[1].Pal Bhunia, Engineering Mathematics, Oxford University Press, 2015.
[2].Erwin Kreyszig , " Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition, 2015.
[3].B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1st Edition, 2007.
[4].N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9th Edition, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)
[2]. nptel.ac.in/courses/122104017
[3]. nptel.ac.in/courses/111105035
[4]. Engineering Mathematics Open Learning Project.
www.3.ul.ie/~mlc/support/Loughborough%20website/

17CH1102/17CH1202

ENGINEEERING CHEMISTRY

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Knowledge of Chemistry at Intermediate level	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyze various water treatment methods and boiler troubles.
CO2	Apply the knowledge of different phases in materials, working principle of electrodes and batteries and their application in chemical and other engineering areas
CO3	Evaluate corrosion processes as well as protection methods.
CO4	Apply the knowledge of nature of polymeric materials for their application in technological fields and of fuels for their conservation

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium,H- High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1		**H**										
CO2	**M**											
CO3											**H**	
CO4			**M**									

COURSE CONTENT

UNIT I

Water technology-I: Impurities of water, WHO standards - Water treatment for drinking purpose - sedimentation, coagulation, filtration, disinfection by chlorination, breakpoint chlorination and its significance - Desalination of brackish water - principle and process of electrodialysis and reverse osmosis, advantages and disadvantages.

Water technology-II: Boiler troubles - scales-formation, disadvantages and internal conditioning methods - phosphate conditioning, calgon conditioning and sodium aluminate, sludges-formation, disadvantages and prevention, caustic embrittlement- reasons, mechanism and its control, and boiler corrosion – causes and control.

UNIT II

Phase rule: Concept of phase, component, degree of freedom with examples, Gibb's phase

rule definition - phase equilibrium of one component – water system - condensed phase rule - phase equilibrium of two-component system – silver-lead system – applications of phase rule.

Electrochemistry: Construction and working of Calomel electrode, construction and working of silver-silver chloride electrode and principle, construction and working of glass electrode, determination of pH using glass electrode - Chemistry of modern batteries - $Li/SOCl_2$ battery and $Li_xC/LiCoO_2$ battery - construction, working and advantages.

UNIT III

Corrosion principles: Introduction, definition, reason for corrosion, examples – types of corrosion - chemical and electrochemical corrosion - chemical corrosion- types and Pilling-Bedworth rule, electrochemical corrosion - hydrogen evolution and oxygen absorption – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion.

Corrosion control methods: Cathodic protection- principle and types - impressed current method and sacrificial anode method, anodic protection-principle and method, corrosion inhibitors – types and mechanism of inhibition – principle and process of electroplating and principle and process of electroless plating - advantages of electroless plating over electroplating.

UNIT IV

Polymer technology: Conducting polymers – definition, examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped polyacetylene, doping of conducting polymers- mechanism of conduction of p-doped and n-doped polyacetylenes – applications of conducting polymers, fibre reinforced plastics.

Fuel technology: Fuel-definition, calorific value- lower and higher calorific values, analysis of coal – proximate analysis and ultimate analysis, Petroleum – refining, flue gas analysis by Orsat's apparatus, numericals based on calculation of air required for combustion.

TEXT BOOKS

[1] *Shikha Agarwal*, "Engineering Chemistry – Fundamentals and Applications", Cambridge University Press, New Delhi, 1st edition (2015).

REFERENCE BOOKS:

[1] *Sunita Rattan* , "A Textbook of Engineering Chemistry", S.K. Kataria & Sons, New Delhi, First edition 2012.
[2] *P.C. Jain* , "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Limited, New Delhi, 15th edition.
[3] *B.S. Bahl, G. D. Tuli and Arun Bahl*, "Essentials of Physical Chemistry", S. Chand and Company Limited, New Delhi.
[4] *O. G. Palanna, "* Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd., New Delhi.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.cip.ukcentre.com/steam.htm

[2] http://corrosion-doctors.org/Modi;es/mod-basics.htm

[3] http://www.pharmainfo.net/phase-rule

[4] http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR%2063%289%29%20715-728.pdf

[5] https://chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry

[6] http://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipal-water-treatment/

17CS1103

PROBLEM SOLVING METHODS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 -2- 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the Computer problem solving approaches, efficiency and analysis of algorithms
CO2	Apply the factoring methods to solve the given problem
CO3	Apply the array techniques to find the solution for the given problem
CO4	Solve the problems using MATLAB

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**	**M**							**M**			
CO2	**L**		**H**									
CO3	**L**		**H**						**L**			
CO4	**L**	**L**							**H**			

COURSE CONTENT

UNIT - I

Introduction to Computer Problem Solving: Programs and Algorithms, characteristics of an algorithm, Requirements for solving problems by computer; Flowchart, pseudo-code **The Problem – Solving Aspect**: Problem definition phase, Getting started on a problem, Similarities among problems, Working backwards from the solution, General problem-solving strategies; **Top-Down design**: Breaking a problem into sub-problems, Construction of loops, Establishing initial conditions for loops, Finding the iterative construct, Termination of loops;

The Efficiency of Algorithms: Redundant Computations, Referencing array elements, Inefficiency due to late termination, Early detection of desired output conditions, Trading storage for efficiency gains;

Analysis of Algorithms: Computational complexity, The order notation, Worst and average case behavior.

UNIT - II

Fundamental Algorithms: Problem, Algorithm Development, Algorithm Description - Exchanging values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci sequence, Reversing the digits of an Integer. Using pseudo-codes and flowcharts to represent fundamental algorithms.

Factoring Methods: Finding the Square Root of a number: Smallest Divisor of an Integer, GCD of two Integers, Generating Prime numbers, Computing the Prime Factors of an Integer, Raising a Number to a Large Power, Pseudo random number generation, Computing n^{th} Fibonacci number.

UNIT – III

Array Techniques: Introduction, Array Order Reversal, Array counting, Finding the maximum number in a set, Removal of duplicates from an ordered array, Partitioning an array, Finding The K^{th} Smallest Element.

Merging, Sorting and Searching: Sorting By Selection, Sorting By Exchange, Linear Search, Binary search;

UNIT – IV

Introduction to MATLAB: MATLAB Environment, **Constants, Variables and Expressions:** Data types, Constants and Variables, Operators, Built-in Functions, **Vectors and Matrices:** Introduction, Scalars and Vectors, Matrix Manipulations, **Control Structures:** Loops, Branches.

Input-Output Statements: Reading/Storing File Data, **MATLAB Graphics:** Introduction, Two-Dimensional Plots.

TEXT BOOKS

[1] R.G. Dromey , "How to Solve it By Computer", Prentice-Hall International Series in Computer Science,1982.

[2] Bansal.R.K, Goel.A.K, Sharma.M.K, "MATLAB and its Applications in Engineering", Pearson Education, 2012.

REFERENCE BOOKS

[1]Michael Schneider, Steven W. Weingart, David M. Perlman, "An Introduction to Programming and Problem Solving With Pascal", John Wiley and Sons Inc,1984.

[2]David Gries, "The Science of Programming", Springer Verlag, 1981.

[3]ReemaThareja, "Computer Fundamentals and C Programming", Oxford, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] MATLAB Getting Started Guide http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf

17ME1104B

MECHANICS FOR ENGINEERS

Course Category:	Engineering Sciences	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 2 - 0
Prerequisites:	Basic Mathematics,Physics	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand free body diagrams, develop appropriate equilibrium equations and simplify the system of forces and moments to equivalent systems
CO2	Determine the axial forces in the members of determinate truss and analyze systems with friction.
CO3	Locate centroids and determine Area moment of inertia of rigid bodies
CO4	Determine the mass moment of inertia of rigid bodies and analyse the motion of rigid bodies

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**				**M**							
CO2	**H**				**H**							
CO3	**H**											
CO4	**H**				**H**							

COURSE CONTENT

UNIT I

CONCURRENT FORCES IN A PLANE: Principles of statics, Force, Addition of two forces: Parallelogram Law – Composition and resolution of forces – Constraint, Action and Reaction. Types of supports and support reactions, free body diagram, Equilibrium of concurrent forces in a plane – Method of Projections –Moment of a force, Theorem of

Varignon, Method of moments.

PARALLEL FORCES IN A PLANE: Introduction, Types of parallel forces, Resultant, Couple, Resolution of Force into force and a couple, General case of parallel forces in a plane

UNIT II

GENERAL CASE OF FORCES IN A PLANE: Composition of forces in a plane – Equilibrium of forces in a plane, Plane Trusses**:** Method of joints

FRICTION: Introduction, Classification of friction, Laws of dry friction, Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Wedge friction

UNIT III

CENTROIDS: Determination of centroids by integration method, Centroids of composite plane figures.

AREA MOMENT OF INERTIA OF PLANE FIGURES: Moment of Inertia of a plane figure with respect to an axis in its plane, Moment of Inertia with respect to an axis perpendicular to the plane of the figure, Parallel axis theorem, Moment of inertia for composite areas

UNIT IV

MOMENT OF INERTIA OF MATERIAL BODIES: Moment of inertia of a rigid body – Moment of inertia of laminas- slender bar, rectangular plate, Circular plate, circular ring, Moment of inertia of 3D bodies- cone, solid cylinder, sphere & parallelopiped.

KINEMATICS OF A RIGID BODY IN ROTATION ABOUT A FIXED AXIS: Kinematics of rotation

KINETICS OF A RIGID BODY IN ROTATION ABOUT A FIXED AXIS: – Equation of motion for a rigid body rotating about a fixed axis – Rotation under the action of a constant moment

TEXT BOOKS

[1] S.Timoshenko, D.H.Young, J.V.Rao & Sukumar Pati, " Engineering Mechanics", Vth edition, Mc Graw Hill Education (India) Pvt Ltd,2013 (For Concepts and symbolic Problems).

[2] A.K.Tayal , " Engineering Mechanics Statics and dynamics ", XIIIth edition, Umesh Publications , 2006 (For numerical Problems using S.I.System of Units).

REFERENCE BOOKS

[1] Andrew pytel & Jaan Kiwsalaas , " Engineering Mechanics: Statics and Dynamics ", IIIrd edition, Cengage Learning , 2013.

[2] SS Bhavikatti and KG Rajasekharappa, "Engineering Mechanics", IVth Edition, New Age International Private Limited, 2012.

[3] Beer and Johnston, "Vector Mechanics for Engineers Statics and Dynamics", IIIrd

edition, Tata McGraw Hill, 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://emweb.unl.edu/, Accessed On 15-06-2017

17ME1105/17ME1205
ENGINEERING GRAPHICS

Course Category:	Institutional Core	**Credits:**	4
		Lecture-Tutorial –Practice:	2-0-6
Course Type:	Theory&Practice	**Continuous Evaluation:** **Semester end Evaluation:**	30 70
Prerequisites:		**Total Marks:**	100

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1	Understand the Scales, conics and Cycloidal curves.
CO2	Draw Orthographic projections of points, Lines, Planes and Solids
CO3	Understand Sectional views of Solids, Development of surfaces and their representation
CO4	Construct isometric scale, isometric projections ,isometric views and convert pictorial views to orthographic projections

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**			**H**							**L**	
CO2	**M**			**H**							**M**	
CO3	**M**			**M**							**M**	
CO4	**L**			**H**							**M**	

COURSE CONTENT

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance

Scales: Construction of plain and diagonal Scales

Conic Sections: Construction of ellipse, parabola and hyperbola (Treatment is limited to Eccentricity or General method only)

Engineering Curves: Cycloidal curves - Cycloid, Epicycloid and Hypocycloid

UNIT–II

Orthographic Projections: Principles of Orthographic Projections –Projections of Points, Lines (Treatment is limited to First Angle Projection) and Projections of Plane regular geometric figures (Up to Plane Inclined to both of the Reference planes)

UNIT – III

Projections of Solids: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions (Limited to Solid Inclined to one of the Reference planes)

Sections of Solids: Sections of solids such as Cubes, Prisms, Pyramids, Cylinders and Cones. True shapes of sections(Limited tothe solids perpendicular to one of the Principal Planes)

UNIT – IV

Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones

Isometric Projections: Isometric Projection and conversion of isometric views into Orthographic Projections (Treatment is limited to simple objects only)

Conventions Auto CAD: Basic principles only (Internal assessment only)

Text Books

[1] N.D. Bhatt & V.M. Panchal, "Elementary Engineering Drawing", Charotar Publishing House, Anand. 49th Edition – 2006

[2] Basanth Agrawal & C M Agrawal," Engineering Drawing", McGraw Hill Education Private Limited, New Delhi

Reference Books

[1] K. L. Narayana & P. Kannaiah, "Text Book on Engineering Drawing", Scitech publications (India) Pvt. Ltd.,Chennai, 2nd Edition - fifth reprint 2006

[2] K. Venugopal, "Engineering Drawing and Graphics + Auto CAD", New Age International, New Delhi

[3] D M Kulkarni, AP Rastogi, AK Sarkar, "Engineering Graphics with Auto CAD", PHI Learning Private Limited, Delhi Edition – 2013

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[1] http://www.youtube.com/watch?v=XCWJ XrkWco, Accessed On 01-06-2017.

[2] http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html# isodrawing, Accessed On 01-06-2017.

[3] http://www.slideshare.net, Accessed On 01-06-2017.

[4] http://edpstuff.blogspot.in, Accessed On 01-06-2017.

17CH1151 / 17CH1251

ENGINEERING CHEMISTRY LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Knowledge of chemistry practicals at intermediate level	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyze quality parameters of water samples from different sources
CO2	Perform quantitative analysis using instrumental methods.
CO3	Apply the knowledge of mechanism of corrosion inhibition, metallic coatings and photochemical reactions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1		**H**										
CO2											**M**	
CO3					**M**							

COURSE CONTENT

List of Experiments:

1. Determination of total alkalinity of water sample
2. Determination of chlorides in water sample
3. Determination of hardness of water sample
4. Determination of available chlorine in bleaching powder
5. Determination of copper in a given sample
6. Determination of Mohr’s salt – Dichrometry
7. Determination of Mohr’s salt – Permanganometry
8. Determination of purity of boric acid sample

9. Conductometric determination of a strong acid using a strong base
10. pH metric titration of a strong acid vs. a strong base
11. Determination of corrosion inhibition efficiency of an inhibitor for mild steel
12. Chemistry of Blue Printings
13. Preparation of Urea-Formaldehyde resin

REFERENCE BOOKS

[1] S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2nd edition.

[2] Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2nd edition.

17CS1152

COMPUTING AND PERIPHERALS LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 – 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand and Apply MS Office tools
CO2	Configure the components on the motherboard and install different operating systems
CO3	Understand and configure different storage media
CO4	Perform Networking, troubleshooting and system administration tasks

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**								**L**		**M**	
CO2		**M**	**M**						**L**			
CO3	**H**											
CO4		**L**	**M**						**M**			

COURSE CONTENT

CYCLE - I:Word Processing, Presentations and Spread Sheets

1. **Word Processing:**

   a) Create personal letter using MS Word.

   b) Create a resume using MS Word.

   c) Creating project abstract**:** Features to be covered:- Table of Content, List of Tables, Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check,Track Changes.

d) Creating a Newsletter: Features to be covered:- Table of Content, List of figures, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphsand Mail Merge in word.

2. **Spread Sheets:**

a) Create a worksheet containing pay details of the employees.

b) Creating a Scheduler: Features to be covered:- Gridlines, Format Cells, Summation, auto fill,Formatting Text

c) Create a worksheet which contains student results: .Features to be covered:- Cell Referencing, Formulae in excel – average, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

d) Create a worksheet importing data from database and calculate sum of all the columns.

3. Presentations:

a) Create a presentation using themes.

b) Save, edit, print and import images/videos to a presentation.

c) Create a power Point presentation on business by using master layouts, adding animation to a presentation and see the presentation in different views.

4. MS Access:

a) Create simple table in MS Access for results processing.
b) Create a query table for the results processing table.
c) Create a form to update/modify the results processing table.
d) Create a report to print the result sheet and marks card for the result.

CYCLE - II: Hardware Experiments

1. Identification of System Layout: Front panel indicators & switches and Front side & rear side connectors. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD,HDD, CD, DVD and add on cards. Install Hard Disk. Configure CMOS-Setup. Partition and Format Hard Disk.

2. Install and Configure a DVD Writer or a Blu-ray Disc writer.

3. Install windows operating system and check if all the device (graphics, sound, network etc.) drivers are installed.

4. Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.

5. Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.

6. PC system layout: Draw a Computer system layout and Mark the positions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVDDrive add on cards in table top / tower model systems.

7. Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, cooling fan, I/O slots and I/O ports and various jumper settings.

8. Configure BIOS setup program to change standard and advanced settings to troubleshoot typical problems.

9. Install and configure Printer/Scanner/Web cam/Cell phone/bio-metric device with system. Troubleshoot the problems

CYCLE – III : Netwroking

1. Prepare an Ethernet/UTP cable to connect a computer to network switch. Crimp the 4 pair cable with RJ45 connector and with appropriate color code.

2. Manually configure TCP/IP parameters (Host IP, Subnet Mask andDefault Gateway) for a computer and verify them using IPCONFIG command. Test connectivity to a server system using PING command.

3. Creating a shared folder in the computer and connecting to that folder using Universal Naming Convention (UNC) format. (Ex:computername sharename)

4. Connects computers together via Switch/ Hub

5. Connect different devices via Switch/Hub

6. Statically configure IP address and subnet mask for each computer

7. Examine non-existent IP address and subnet conflicts

8. Configure a computer to connect to internet (using college internetsettings) and troubleshoot the problems using PING, TRACERT and NETSTAT commands.

9. Using scan disk, disk cleanup, disk Defragmenter, Virus Detectionand Rectifying Software to troubleshoot typical computer problems.

10. Configure DNS to establish interconnection between systems anddescribe how a name is mapped to IP Address.

11. Remote desktop connections and file sharing.

12. Installation Antivirus and configure the antivirus.

13. Introducing Ethereal , a packet capture tool.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar,Department of Physics, IIT Madras https://www.youtube.com/ watch?v=zjyR9e-#1D4&list=PLC5DC6AD60D798FB7

[2] Introduction to Coding ConceptsInstructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11

17MC1106/17MC1206

PROFESSIONAL ETHICS & HUMAN VALUES

Course Category:	Mandatory Learning	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Know the moral autonomy and uses of ethical theories.
CO2	Understand morals, Honesty and character.
CO3	Understand about safety, risk and professional rights.
CO4	Know the ethics regarding Global issues related to Environment, Computers and weapon's development.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**M**											
CO2								**L**				
CO3						**M**						
CO4									**M**			

COURSE CONTENT

UNIT I

Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issues- types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory -Gilligan's theory - consensus and controversy - Models of Professional Roles -theories about right action - Self-interest - customs and religion- uses of ethical theories.

UNIT II

Human Values:Morals, Values and Ethics - Integrity- Work Ethic – Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring – Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment –Empathy - Self-Confidence - Character - Spirituality .

UNIT III

Engineering as Social Experimentation: Engineering as experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT IV

Global Issues: Multinational corporations- Environmental ethics- computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York (1996).

2. Govindarajan M, Natarajan S, Senthil Kumar V. S., "Engineering Ethics", Prentice Hall of India, New Delhi(2004).

REFERENCE BOOKS

[1] Baum, R.J. and Flores, A., "Ethical Problems in Engineering, Center for the studyof the Human Dimensions of Science and Technology", Rensellae Polytechnic Institute,Troy, New York, 335 pp. eds. (1978)

[2] Beabout, G.R., Wennemann, D.J. , "Applied Professional Ethics: A Developmental Approach for Use with Case Studies", University Press of America Lanham, MD, 175 pp (1994).

17MA1201

LAPLACE TRANSFORMS AND INTEGRAL CALCULUS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 2 - 0
Prerequisites:	Vectors, Curve Tracing.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Solve Linear Differential Equations using Laplace Transforms.
CO2	Examine the nature of the Infinite series.
CO3	Evaluate areas and volumes using Double, Triple Integrals.
CO4	Convert Line Integrals to Area Integrals and Surface Integrals to Volume Integrals.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**				**M**						**L**	
CO2	**H**				**M**						**L**	
CO3	**H**				**M**						**L**	
CO4	**H**				**M**						**L**	

COURSE CONTENT

UNIT I

Laplace Transforms: Introduction, Definition, Conditions for Existence, Transforms of Elementary functions, Properties of Laplace Transforms, Transforms of Periodic functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by t^n, Division by 't',

Inverse Transforms, Method of partial fractions, Other methods of finding Inverse Transform, Convolution Theorem, Unit Step and Unit Impulse functions.

Applications: Evaluation of Improper Integrals, Solving Differential equations by Laplace Transform.

UNIT II

Partial Differential Equations: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order. **Sequence and Series**: Convergence of series, Comparison test, Integral test, D'Alembert's Ratio test, Cauchy's Root Test, Alternating series test, Absolute and Conditional convergence.

UNIT III

Integral Calculus: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Triple Integrals, Change of Variables. **Applications:** Area enclosed by Plane Curves, Volumes of Solids.

Special Functions: Beta Function, Gamma Function, Relation between Beta and Gamma Function, Error Function.

UNIT IV

Vector Calculus: Scalar and Vector point functions, Del applied to Scalar point functions, Del applied to Vector point functions, Physical interpretation of Divergence, Del applied twice to point functions, Del applied to products of point functions. Integration of Vectors, Line Integral, Surface Integral, Green's Theorem in a plane, Stokes's Theorem, Volume Integral, Gauss Divergence Theorem, Irrotational Fields.

TEXT BOOKS

[1] B.S.Grewal, "Higher Engineering Mathematics, Khanna Publishers", 43rd Edition, 2014.

REFERENCE BOOKS

[1].Erwin Kreyszig , "Advanced Engineering Mathematics" , John Wiley & Sons, 10th Edition,2015
[2].B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1st Edition,2007
[3].N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9th Edition,2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)
[2]. nptel.ac.in/courses/122104017
[3]. nptel.ac.in/courses/111105035
[4]. Engineering Mathematics Open Learning Project.
www.3.ul.ie/~mlc/support/Loughborough%20website/

17PH1102 / 17PH1202

ENGINEERING PHYSICS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyze the importance of dual nature of matter and study the classification of materials
CO2	Classify various properties of magnetic and dielectric materials and their applications
CO3	Apply the concepts of light in optical fibers and lasers and learn various types of superconductors
CO4	Understand the nanoscale and characterization of nanomaterials and their applications in various fields

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**											
CO2	**H**	**M**										
CO3	**H**	**H**	**M**		**M**						**M**	
CO4	**H**		**L**							**M**		

COURSE CONTENT

UNIT I

Quantum Mechanics: Dual nature of light, Matter waves and Debroglie's hypothesis, G.P.Thomson experiment, Heisenberg's uncertainty principle and its applications (Non existence of electron in nucleus, Finite width of spectral lines), One dimensional time independent Schrödinger's wave equation, physical significance of wave function, Particle in a box (One dimension).

Semiconductor Physics: Classification of materials based on energy diagram, Fermi level in Intrinsic and extrinsic semiconductors ,Carrier drift and Carrier diffusion, Generation and recombination process (qualitative), Hall Effect.

UNIT II

Magnetic properties: Magnetic permeability, Magnetization, Origin of magnetic moment, Classification of magnetic materials -dia, para, ferro magnetic materials, Hysteresis curve, Soft and hard magnetic materials.

Dielectric properties: Fundamental definitions: Dielectric constant, Electric polarization, Polarizability, Polarization vector, Electric displacement, Electric susceptibility, Types of Polarization: Electronic, Ionic, Orientation, Space charge polarization, Internal fields in solids (Lorentz method), Clausius-Mossotti equation,ferroelectrics and their applications.

UNIT III

Superconductivity: Introduction, Critical parameters, Flux quantization, Meissner effect, Types of Superconductors, BCS theory, Cooper pairs, London's equation- penetration depth, high temperature super conductors, Applications of superconductors.

Lasers: Spontaneous emission, Stimulated emission, Population inversion, Solid state (Ruby) laser, Gas (He–Ne) laser, Semiconductor (Ga-As) laser, Applications of lasers.

Fiber optics: Propagation of light through optical fiber, Types of optical fibers, Numerical aperture, Fiber optics in communication and its advantages.

UNIT IV

Nanotechnology: Basic concepts of Nanotechnology, Nano scale, Introduction to nano materials, Surface to volume ratio, General properties of Nano materials, Fabrication of nano materials: Plasma Arcing, Sol-gel, Chemical vapour deposition, Characterization of nano materials: AFM, SEM, TEM, STM, Carbon nano tubes: SWNT, MWNT, Formation of carbon nanotubes: Arc discharge, Laser ablation, Properties of carbon nano tubes, Applications of CNT's & Nanotechnology.

TEXT BOOKS

[1] M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", IXth Revised ed. , S. Chand Publications, 2014.

REFERENCE BOOKS

[1] R.K.Gaur and S.L.Gupta, "Engineering Physics", VIIIth ed., Dhanpatrai publishers, 2012.

[2] S.O. Pillai, "Solid State Physics", VIIth ed., New age international publishers, 2015.

[3] M.R. Srinivasan, "Engineering Physics", IInd ed., New age international publishers, 2017.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/

[2] https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/laser-fundamentals-i/
[3] http://nptel.ac.in/courses.php?disciplineId=115
[4] http://www.light and matter.com/bk4.pdf
[5] http://freevideolectures.com/Course/3048/Physics-of-Materials/36
[6] http://www.electronics-tutorials.ws/diode/diode_1.html
[7] http://www.chm.bris.ac.uk/webprojects2000/igrant/main.html
[8] https://www.peterindia.net/NanoTechnologyResources.html

17CS1203

PROGRAMMING IN C

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 -2 – 0
Prerequisites:	Problem Solving Methods	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the fundamentals and structure of a C programming language
CO2	Apply the loops, arrays, functions and string concepts in C to solve the given problem.
CO3	Apply the pointers and text input output files concept to find the solution for the given applications.
CO4	Use Enumerated, Datatypes,Structures and Unions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**L**				**L**						**L**	
CO2	**L**				**L**						**L**	
CO3	**H**				**M**			**L**	**H**		**M**	
CO4	**H**				**H**			**L**	**H**		**H**	

COURSE CONTENT

UNIT - I

Introduction to the C Language : Background, C Programs, Identifiers, Types, Variables, Constants, Input/Output, Programming Examples.

Structure of a C Program: Expressions, Precedence and Associatively, Evaluating Expressions, Type Conversion, Statements, Sample Programs.

Selection: Storage Class,Logical Data and Operators, Two -Way Selection, Multiway Selection, More Standard Functions

UNIT - II

Repetition: Concept of a Loop Loops In C, Loop Examples, Recursion, The Calculator Program.

Arrays: Concepts, Using Array in C, Inter-Function Communication, Array Applications, Two Dimensional Arrays, Multidimensional Arrays.

Functions: Functions in C, User Defined Functions, Inter Function Communication, Standard Functions, Scope.

Strings: String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String- Data Conversion.

UNIT - III:

Pointers: Introduction, Pointers For Inter Function Communications, Pointers to Pointers, Compatibility, Lvalue and Rvlaue.

Pointer Applications: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocations Functions, Array of Pointers.

Text Input/output: Files, Streams, Standard Library Input/Output Functions, Formatting Input/output Functions and Character Input/Output Functions, Command-Line Arguments.

UNIT - IV:

Enumerations: The Type Definition(Typedef) , Enumerated Types: Declaring an Enumerated Type , Operations on Enumerated Types, Enumeration Type Conversion, Initializing Enumerated Constants, Anonymous Enumeration: Constants, Input/Output Operators.

Structures: Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures, Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures through Pointers.

Unions: Referencing Unions, Initializers, Unions and Structures, Internet Address, Programming Applications.

TEXT BOOKS

[1] Behrouz A. Forouzan & Richard F. Gilberg , "Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS

[1]Kernighan and Ritchie , "The C programming language" , The (Ansi C Version), PHI, second edition.

[2]Yashwant Kanetkar , "Let us C" , BPB Publications, 2nd Edition 2001.

[3]Paul J. Dietel and Dr. Harvey M. Deitel, "C: How to Program", Prentice Hall ,7th edition (March 4,2012).

[4]Herbert Schildt, "C:The Complete reference", McGraw Hill, 4th Edition, 2002.

[5]K.R.Venugopal, Sundeep R Prasad, "Mastering C", McGraw Hill, 2nd Edition ,2015

17EE1204

NETWORK ANALYSIS-I

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 2 - 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand DC and AC circuit concepts
CO2	Apply Network Theorems for Circuit Analysis.
CO3	Understand Series and Parallel resonance concepts and analyze Coupled Circuits.
CO4	Analyze Polyphase Circuits and apply different Power measurement techniques.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**	**H**			**M**							
CO2	**H**	**H**										
CO3	**M**				**M**							
CO4	**M**											

COURSE CONTENT

UNIT I

Basic components and electric circuits: Charge, Current, Voltage and Power; Voltage and Current Sources - independent and dependent sources, Ohm's Law, series and parallel connected sources; Circuit elements - Resistance, Inductance and capacitance; Series and Parallel combination of circuit elements. Star-Delta Transformations; Voltage and Current Division, source transformations, power & energy calculations.

Sinusoidal Steady State Analysis: Introduction, characteristics of sinusoids, Steady state response to sinusoidal functions, Complex forcing functions, Phasor. Phasor relationship for R, L and C Series RL circuit, RC circuit and RLC circuit, Parallel AC circuits, Impedance, admittance. Kirchhoff's Voltage and Current Laws, Basic mesh and super mesh analysis; Basic nodal and super node analysis.

Instantaneous power, Average power- calculation of average power for periodic and non-periodical wave forms, Effective values of current and voltage, Complex power,

UNIT II

Network Theorems to DC & AC Circuits: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem and Compensation Theorem.

UNIT III

Series and Parallel Resonance: Series Resonance, resonant frequency, Voltages and Currents in a Series Resonant circuit, Bandwidth of an RLC series circuit, Quality factor (Q) and its effect on Bandwidth, Magnification in Series Resonance. Parallel Resonance, resonant frequency of parallel RLC circuit, Reactance curves in Parallel Resonance, Q factor of Parallel Resonance, Bandwidth of parallel RLC circuit, Resonant frequency for a tank circuit, Magnification in Parallel Resonance.

Coupled Circuits: Introduction- self inductance, Mutual inductance; Coefficient of Coupling Inductances in series and parallel, Dot convention, Coupled circuits, Conductively coupled equivalent circuits.

UNIT IV

Polyphase Circuits: Polyphase System, Advantages of Three-Phase System, Generation of Three-Phase Voltages, Phase Sequence, Inter Connection of Three-Phase Sources and Loads, Voltage, Current and Power in a Star Connected System. Voltage, Current and Power in a Delta Connected System. Three-phase balanced and unbalanced circuits.

Power Measurement in Three-Phase Circuits: Power in three phase circuits – Two wattmeter and Three wattmeter methods, Power Factor of balanced circuits by two wattmeter method, Variation in wattmeter readings with load power factor (lag and lead p.f. loads), Measurement of reactive power with two watt meter and single wattmeter. Power factor of an unbalanced system.

TEXT BOOKS

[1] W.H.Hayt, J.E.kemmerly and S.M.Durbin, "*Engineering Circuit Analysis"*, Tata McGraw-Hill, New Delhi, ,8th ed., 2012.

[2] A.Chakrabarti., "*Circuit Theory (Analysis and Synthesis)*", Dhanpat Rai & Co. Delhi, 6th ed., 2010.

REFERENCE BOOKS

[1] Charles K. Alexander, Matthew N. O. Sadiku, "*Fundamentals of. Electric Circuits*", McGraw-Hill,New York, 5th ed., 2013.

[2] Ravish R Singh, "*Network Analysis and Synthesis*", Mc Graw-Hill Education (India) Pvt. Ltd.,1st ed., 2013.

[3] A.Sudhakar and Shyammohan S.Palli, "*Circuits & Networks Analysis and Synthesis*", Tata McGraw-Hill, New Delhi, 3rd ed., 2007.

[4] Van valeken berg. "*Network Analysis and Synthesis"*, PHI New Delhi,3rd ed.,.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://nptel.ac.in/courses.php?branch=eee
[2] http://ocw.mit.edu/courses/audio-video-courses/#electrical-engineering-and-computer-science

17HS1105/ 17HS1205

TECHNICAL ENGLISH &COMMUNICATION SKILLS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 2
Prerequisites:	Basic understanding of the language skills ,viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Develop administrative and professional compilations including web related(On-line) communication with felicity of expression
CO2	Demonstrate Proficiency in Interpersonal Communication, in addition to standard patterns of Pronunciation
CO3	Apply the elements of functional English with sustained understanding for authentic use of language in any given academic and/or professional environment
CO4	Execute tasks in Technical communication with competence

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1				**H**		**H**	**H**	**H**	**H**	**H**	**L**	**M**
CO2				**H**		**H**	**H**	**H**	**H**	**H**		**M**
CO3	**M**			**H**		**H**	**H**	**H**	**H**	**H**	**L**	**M**
CO4	**L**	**M**		**H**		**H**	**H**	**H**	**H**	**H**	**L**	**M**

COURSE CONTENT

UNIT I

Professional Writing Skills

- Professional Letter- Business, Complaint and Transmittal
- Essay Writing- Descriptive and Analytical

- Administrative and On-line drafting skills –Minutes and Web notes including e-mail

UNIT II

Interpersonal Communication Skills

- **Communicative Facet**- Speech acts- Extending Invitation, Reciprocation, Acceptanc Concurrence, Disagreeing without being disagreeable
- **Articulation-oriented Facet**- Transcription using International Phonetic Alphabet, Primary Stress

UNIT III

Vocabulary and Functional English

- A basic List of 500 words – Overview
- Verbal analogies, Confusables, Idiomatic expressions and Phrasal Collocations
- Exposure through Reading Comprehension- Skimming, Scanning and Understanding the textual patterns for tackling different kinds of questions
- Functional Grammar with special reference to Concord, Prepositions, use of Gerund an Parallelism

UNIT IV

Technical Communication skills:

- Technical Proposal writing
- Technical Vocabulary- a representative collection will be handled
- Introduction to Executive Summary
- Technical Report writing(Informational Reports and Feasibility Report

TEXT BOOKS

[1] Martin Cutts, " Oxford guide to Plain English", Oxford University Press, 7th Impression 2011.
[2] TM Farhathullah, "Communication skills for Technical Students", Orient Longman, I Edition 2002
[3] John Langan, "College Writing Skills", McGraw Hill, IX Edition, 2014.
[4] "Eclectic Learning materials offered by the Department"

REFERENCE BOOKS

[1] Randolph Quirk, "Use of English", Longman, I Edition (1968) Reprinted 2004.
[2] Thomson A.J & A.V, Martinet, "Practical English Grammar", Oxford University Press, III Edition 2001
[3] V.Sethi and P.V. Dhamija, "A Course in Phonetics and Spoken English", PHI, II Edition 2006

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.britishcouncil.org/english *Accessed on 15th June 2017*
[2] www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online *Accessed on 15th June 2017*
[3] https://www.uni-marburg.de/sprachenzentrum/selbstlernzentrum/.../apps_for_esl.pdf *Accessed on 15th June 2017*

17HS1106/17HS1206

TECHNOLOGY AND SOCIETY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1 - 0 – 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the origins of technology and its role in the history of human progress.
CO2	Know the Industrial Revolution and its impact on Society.
CO3	Interpret the developments in various fields of technology till Twentieth Century.
CO4	Distinguish the impacts of Technology on the Environemnt and achievements of great scientists.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**								**L**			
CO2	**H**							**M**				
CO3	**H**								**L**			
CO4	**H**							**M**				

COURSE CONTENT

UNIT – I

Introduction: Origins of technology, The Agriculture revolution, Technological contributions of ancient civilizations- Mesopotamian, Egyptians, Greeks, Romans, Indians and Chinese.

UNIT - II

Industrial revolution: The social and political background, The technical background, Steam: The power behind the Indistrial Revolution, The revolution in Textile Indistry, The Imapact of Indutrial Revolution on Society.

UNIT - III

The Flowering of modern technology: Manufacturing Technologies, Prime Movers, Internal Combustion engines, Production of Metals and Allyos, The Birth of Electrical Technology, Twentieth Century: The Flowering of modern technology

UNIT - IV

Technology, Science and Society: Impact of technology on society, The Impacts of Technology on the environment, Sustainable development.

Achievements of famous scientists:

(**World**): Einestein, Newton, Faraday, Graham Bell, Edison, S.Hawking.

(**India**): CV Raman, S.Chandrasekhar, Aryabhatta, Homi J Bhabha, Vikram Sarabhai, APJ Abdulkalam, S.Ramanujan, M.Visweswarayya.

TEXT BOOKS

[1] Dr. R.V.G Menon, "Technology and Society", Pearson Education, 2011

REFERENCE BOOKS

[1] Quan-Haase, A., " Technology and Society: Inequality, Power, and Social Networks", Oxford University Press, 2013.

17PH1151 / 17PH1251

ENGINEERING PHYSICS LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Use function generator, spectrometer, travelling microscope and CRO in various experiments
CO2	Test optical components using principles of interference and diffraction of light
CO3	Determine the V-I characteristics of solar cell and photo cell and appreciate the accuracy in measurements

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**	**M**										
CO2	**H**											
CO3	**H**	**M**								**M**		

COURSE CONTENT

1. AC Sonometer –Verification of vibrating laws (Virtual Lab)
2. Measurement of thickness of a foil using wedge method
3. Photo tube-Study of V-I Characteristics, determination of work function (Virtual Lab)
4. Torsional Pendulum-Rigidity modulus calculation
5. Variation of magnetic field along the axis of current-carrying circular coil
6. Compound pendulum-Measurement of ‘g’
7. LCR circuit-Resonance
8. Solar cell –Determination of Fill Factor

9. Hall effect –Study of B & I Variation (Virtual Lab)
10. B-H Curve Unit- Determination of hysteresis loss
11. Newton's Rings-Radius of curvature of plano convex lens
12. Diffraction grating-Measurement of wavelength
13. Fibre Optics-Numerical aperture calculation
14. Lissajous figures- calibration of an audio oscillator
15. Figure of merit of a galvanometer

TEXT BOOKS

[1] Madhusudhan Rao, "Engineering Physics Lab Manual", Ist ed., Scitech Publications, 2015

[2] Ramarao Sri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics"., Vth ed., Excell Books, 2010

E-RESOURCES

[1] http://plato.stanford.edu/entries/physics-experiment

[2] http://www.physicsclassroom.com/The-Laboratory

[3] http://facstaff.cbu.edu/~jvarrian/physlabs.html

VIRTUAL LAB REFERENCES

[1] http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1

[2] http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1

[3] http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

17CS1252

COMPUTER PROGRAMMING LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 – 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Implement the use of programming constructs in a structured oriented programming language
CO2	Implement conditional and iterative statements through C Language
CO3	Analyze and implement user defined functions to solve real time problems
CO4	Implement the usage of pointers and file operations on data
CO5	Implement the user defined data types via structures and unions to solve real life problems

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**											
CO2	**L**											
CO3	**M**				**M**			**L**	**M**		**M**	
CO4	**M**								**M**		**L**	
CO5	**H**				**M**				**M**		**L**	

COURSE CONTENT

CYCLE – I : PROGRAMMING CONSTRUCTS AND CONTROL STRUCTURES

1. Introduction to C Pogramming:
   a) Use of Turbo C IDE

b) The Structure of C Program with Sample program

2. Data Types and Variables:

a) Programs to usage of keywords and identifiers in c

b) Programs on declaration of variables, rules for naming a variable, constants and different type of constants, data types

c) Programs to perform on various operators in C

3. Branching and Selection:

a) To specify the conditions under which a statement or group of statements should be executed.

b) To choose exactly one out of two statements (possibly compound statements) to be executed; specifies the conditions under which the first statement is to be executed and provides an alternative statement to execute if these conditions are not met.

c) To choose one statement (possibly compound) to be executed from among a group of state- ments (possibly compound); specifies the conditions under which each statement may be executed and may contain a default statement (in an else clause at the end) to be executed if none of these conditions are met. Note that in the absence of a final else clause, it may be the case that none of the statements are executed.

4. Unconditional control Transfer statements in C:

a) Design and develop programs that use of goto Statement

b) Design and develop programs that the use of Break Statement

c) Design and develop programs that use of Continue Statement

5. Looping constructs:

Design and develop programs based on

a) Iterative loops using While, Do While, For, Nested For

b) Selection Statement using the switch-case Statement

c) Multiple way selections that will branch into different code segments based on the value of a variable or expression

6. Arrays

a) Design and develop programs which illustrates the implementation of single-dimensional arrays and Multi dimensional arrays

7. Strings

a) Create programs to initialize strings and usage of them for various input, output operations.

b) Design and develop programs to handle String functions

CYCLE - II: ADVANCED PROGRAMMING CONSTRUCTS

1.Concept of user defined functions

a) Design and develop programs depending on functions both user defined and standard library functions in C with different approaches.

2. File handling operations

a) FILE structure

b) Opening and closing a file, file open modes

c) Reading and writing operations performed on a file
d) File Pointers: stdin, stdout and stderr
e) FILE handling functions: fgetc(), fputc(), fgets() and fputs() Functions

3. Pointers:
   a) Programs on declaration of pointers and their usage in C
   b) Programs to relate between arrays and pointers and use them efficiently in a program
   c) To pass pointers as an argument to a function, and use it efficiently in program
4. Command Line Arguments
   a) Design and develop programs that accept arguments from command line to perform different kinds of operations
5. Structures and Unions
   a) Programs to define, declare and access structure and union variables
   b) Design and develop programs to work with pointers to access data within a structure programs to pass structure as an argument to a function

TEXT BOOKS

[1] Ashok N Kamthane, "C And Data Structures", Pearson Education; First edition, 2008

REFERENCE BOOKS

[1] Brain W Kernighan and Dennis Ritchie, "The C Programming language", Pearson Education India,2015

[2] David Griffiths and Dawn Griffiths, "Head First C":A Brain Friendly Guide, O:Reilly media, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Introduction to Programming C: http://nptel.ac.in/courses/106104128/

[2] C-Programming - IIT Kharagpur lectures https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLeCxvb23g7hrw27XlkHtfygUTQ0TmFfP

[3] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4&list=PLC5DC6AD60D798FB7

17ME 1153/17ME1253
BASIC WORKSHOP

Course Category:	Engineering Sciences	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Model and develop various basic prototypes in the Carpentry trade.
CO2	Develop various basic prototypes in the trade of Welding.
CO3	Model and develop various basic prototypes in the trade of Tin Smithy.
CO4	Familiarize with various fundamental aspects of house wiring.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	**H**	**H**									**L**	
CO2	**M**	**H**									**L**	
CO3	**M**	**H**									**L**	
CO4	**L**	**H**									**L**	

COURSE CONTENT

UNIT I

Carpentry:

a. Study of tools & operations and various carpentry joints.
b. Practice of open bridle joint, Cross half lap joint, Half LapT Joint, and Dove tail joint
c. Simple group exercise like preparation of single widow frame.

UNIT II

Welding:

a. Study of tools and operations of Gas welding and arc welding.
b. Practice of various joints like weld layer practice, V- Butt Joint, Double parallel fillet joint, T-Joint, and Corner Joint.

UNIT III

Tin Smithy:

a. Study of tools & operations
b. Practice of various joints like Saw Edge, Wired Edge, Lap Seam, and Grooved Seam.
c. Simple exercise like Fabrication of square tray.

UNIT IV

House Wiring:

a. To connect one lamp with one switch.
b. To connect two lamps with one switch.
c. To connect a fluorescent Tube.
d. Stair case wiring.
e. Godown wiring.
f. Study of single phase wiring for a office room.
g. Nomenclature & measurement of wire gauges and cables.
h. Estimation of cost of indoor wiring for a wiring diagram (plan of a building).
i. Test procedure for continuity of wiring in a electric installation.
j. Measurement of electric energy by using meter.

TEXT BOOKS

[1] Kannaiah P. & Narayana K. C., "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.
[2] Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

REFERENCE BOOKS

[1] Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, Practice and Work Book", Suma Publications, Chennai, 2005.

Semester III

Contact Hours: 28

S.No	Course Code	Course	L	T	P	Credits
1.	17MA1301/EE	Transformations & Numerical Methods	3	1	0	4
2.	17EE3302	Electronic Circuits	3	0	0	3
3.	17EE3303	Electrical Machines - I	3	1	0	4
4.	17EE3304	Network Analysis - II	3	1	0	4
5.	17EE3305	Digital Electronics	3	0	0	3
6.	17TP1306	Logic & Reasoning	0	0	2	1
7.	17EE3351	Networks & Electrical Machines-I Lab	0	0	3	1.5
8.	17EE3352	Electronic Circuits Lab - I	0	0	3	1.5
Total			**15**	**3**	**8**	**22**
9.	**17MC1307B**	Indian Constitution (EIE/CE/ME/EEE)	**2**	**0**	**0**	**-**

17MA1301/EE: TRANSFORMATIONS & NUMERICAL METHODS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 1 - 0
Prerequisites:	Basic concepts of Trigonometry and Theory of equations.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	Analyze general periodic functions in the form of an infinite convergence series of sines and cosines												
	CO2	Apply Fourier Transforms to evaluate indefinite integrals and engineering problems.												
	CO3	Solve Algebraic and transcendental, system of equations and understand the concept of polynomial interpolation.												
	CO4	Understand the concept of Numerical differentiation and integration. Solve initial and boundary value problems												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
	CO1	**H**				**M**				**L**		**L**		**L**	
	CO2	**H**				**M**				**L**		**L**		**L**	
	CO3	**H**				**M**				**L**		**L**		**L**	
	CO4	**H**				**M**				**L**		**L**		**L**	

Course Content

UNIT- I **[Text Book-1]**

Fourier Series: Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, odd and even functions, Expansions of odd and even periodic functions, Half - range series, Parseval's formula, complex form of Fourier series. Practical harmonic analysis.

UNIT – II **[Text Book-1]**

Fourier Transforms: Introduction, Definition, Fourier integrals, Fourier sine and cosine integrals - complex form of Fourier integrals. Fourier transforms, Fourier sine and cosine transforms - Finite Fourier sine and cosine transforms, Fourier transforms of the derivatives of a function. Parseval's Identity for Fourier Transforms.

UNIT-III **[Text Book-1]**

Numerical Methods: Solution of Algebraic and Transcendental

	Equations : Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method. **Interpolation:** Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae –Gauss's, Sterling's, Bessel's formulae Interpolation with unequal intervals – Lagrange's and Newton's Interpolation formulae. **UNIT – IV** **[Text Book-1]** **Numerical Differentiation And Integration**: Finding first and second order differentials using Newton's formulae. Trapezoidal rule ,Simpsons 1/3 Rule and Simpsons 3/8 Rule. **Numerical Solutions of Differential Equations**: Taylor's series method Picard's method. Euler's method, Runge - Kutta method of 4th order, Boundary value problems, solution of Laplace's and Poisson's equations by iteration.
Text books and Reference books	**Text Book(s):** [1] B.S.Grewal, "*Higher Engineering Mathematics*", 43rd Edition Khanna Publishers, 2014. **Reference Books:** [1]. Krezig, " *Advanced Engineering Mathematics*", 8th Edition, JohnWiley & sons, 2007 [2]. H.K.Das, Er. Rajnish Verma, "*Higher Engineering Mathematics* "1st Edition, S.Chand, 2011. [3].R.K.Jain & S.R.K.Iyengar, "*Advanced Engineering Mathematics*", 3rd Edition, Narosa Publishers. [4].N.P.Bali, Manish Goyal, "*A Text book of Engineering Mathematics*", 1st, Edition, Lakshmi Publications (P) Limited, 2011. **[5].** S. S. Sastry, "*Introductory Methods of Numerical Analysis*", Printice Hall of India , 2005.
e-resources	[1] mathworld.wolfram.com/fourierseries.html [2] www.thefouriertransform.com

17EE3302: ELECTRONIC CIRCUITS

Course Category	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 0- 0
Prerequisites:	**Network Analysis - I(17EE1204)**	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes

Upon successful completion of the course, the student will be able to:

CO1	Analyze and design basic diode circuits related to various applications.
CO2	Analyze and design different transistor biasing circuits, stabilization and compensation circuits.
CO3	Analyze the behavior of BJT and FET at low frequencies.
CO4	Analyze the behavior of BJT and FET at high frequencies.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		**M**	**H**		**M**								**M**	
CO2		**M**	**H**		**M**								**M**	
CO3		**M**	**H**		**M**								**M**	
CO4		**M**	**H**		**M**								**M**	

Course Content

UNIT-I **[TextBook-1 &2]**

Semiconductor-Diode and its Applications:

overview of P-N Junction Diode; Diode Approximations, Diode as a Rectifier, Half wave, Full wave (Centre-tapped) and Bridge Rectifiers without filter and with inductor filter, Capacitor filter, L- section and π - section filters, multiple L- section, multiple π- section filters, Clippers and Clampers.

Special-purpose diodes: Light-emitting diodes, Laser diodes, Photodiodes, Solar cells, Varactor diode, PIN diode, Tunnel Diode, Zener diodes, Zener diode as Voltage regulator.

UNIT-II **[TextBook-1]**

Transistor & FET Biasing:

Introduction**,** over view of Common Base, Common Emitter, Common Collector configurations, Operating Point, Biasing Circuits- Fixed Bias, Collector to base bias, Self bias, Stability factors, Bias Compensation circuits- Diode compensation for V_{BE} and $I_{CO,}$ Thermistor and Sensistor Compensation, Thermal runaway and thermal stability.

FET Biasing: Fixed Bias, Self bias, Voltage Divider bias.

UNIT- III **[Text Book-1]**

Transistor Amplifiers at Low frequencies:

BJT Amplifiers: Hybrid parameter model of transistor, Measurement of h-parameters, Analysis of transistor amplifier using h- Parameter exact and approximate model of CE, CB and

	CC. **FET Amplifiers:** FET Amplifiers at low frequencies, CS/CD/CG configurations at low frequencies. **UNIT-IV** **[Text Book-1]** **Transistor Amplifiers at High frequencies:** **BJT Amplifiers:** BJT at high frequencies, Hybrid π - model, CE short circuit current gain without load, CE short circuit current gain with resistive load, single stage CE transistor amplifier response, Emitter follower at high frequencies, gain bandwidth product. **FET Amplifiers:** FET amplifier at high frequencies – CS/CD amplifiers.
Text books and Reference books	**Text Book(s):** [1] Jacob Millman, Christos C Halkias & Satyabrata JIT, *"Millman's Electronic Devices and Circuits"*, 3rd Edition, Tata McGraw Hill Ltd, 2007 . [2] Robert L Boylested and Louis Nashelsky, *"Electronic Devices and Circuit Theory"*, PHI, 8th Edition, 2003. [3] David A Bell., "*Electronic Devices and Circuits*", 5th Edition, (2008), Oxford University Press. **Reference Books:** [1] Jacob Millman and Christos C Halkias, *"Integrated Electronics: Analog and Digital Circuits and Systems"*, Tata McGraw Hill Ltd, 2003. [2] G .K. Mithal*" Electronic Devices and Circuits"* Khanna Publishers [3] SSalivahana*" Electronic Devices and Circuits"* Tata McGraw Hill Ltd, 2nd , Edition. [4] David A Bell *"Electronic Devices and Circuits"* 4th edition, Printice Hall of India, 2003 **Note:** Special purpose diodes content available in e-book.
E-resources and other digital material	[1] Tony R.Kuphaldt, "Electric Circuits, Volume III – Semiconductors ",5th Edition, 2009 (e-book). [2]http://nptel.iitm.ac.in/courses.php?branch=Ece [3]www.ibiblio.org/obp/electricCircuits

17EE3303: ELECTRICAL MACHINES-I

Course Category:	Programme core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 1 - 0
Prerequisites:	**Network Analysis-I** (17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Analyze the concepts of Electro-mechanical energy conversion, construction, operation and performance of dc generators.
	CO2	Discuss and analyze the operation and performance of dc motors.
	CO3	Analyze and evaluate the performance of single phase transformers
	CO4	Analyze and evaluate the performance of three phase transformers

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO1 2	PSO 1	PSO 2
CO1	M	H	H		H		H						H	H
CO2	M	H	H		H		H						H	
CO3	M	H	H		H		H						M	H
CO4	M	H	H		L		H						M	H

Course Content

UNIT–I **[Text Book-1]**

Electromechanical Energy Conversion: Energy in Magnetic Systems- Field energy and mechanical force-singly and doubly excited magnetic field systems- forces and torques in systems with electromagnets.

DC Generators: Construction- Principle of operation-types of DC Machine- EMF equation-armature reaction- methods of excitation-commutation and inter poles-compensating windings-characteristics of DC generators.

UNIT–II **[Text Book-2]**

DC Motors: Principle of working-significance of back EMF-torque equation-characteristics - starting methods-speed control -losses and efficiency -braking methods- DC machines applications. Testing of DC machines-Brake test, Swinburne's test, Hopkinson test, retardation test, field test.

UNIT–III **[Text Book-2]**

Single Phase Transformer: Transformer construction-principle of operation-EMF equation-ideal transformer-equivalent circuit-phasor

	diagram- transformer losses-regulation and efficiency –all day efficiency - polarity test-open circuit and short circuit tests- sumpner's test-parallel operation of single-phase transformer-auto transformer- applications of transformers. **UNIT-IV** **[Text Book-2]** **Three-Phase Transformer:** Three phase transformer construction - cooling methods - connections – phase groups-open delta connection, scott connection – three winding transformers (Tertiary winding) – parallel operation of three phase transformers-tap changing of transformers.
Text books or Reference books	**Text Book(s):** [1] I.J.Nagrath and D.P. Kothari, "*Electric Machines*", Tata McGraw-Hill Education Private Limited Publishing Company Ltd, 4th Edition, 2010. [2] Ashfaq Husain, "*Electric Machines*", Dhanpat Rai & Co.(Pvt.) Ltd, 2nd ,Edition, 2009 **Reference Books:** [1] Dr. P. S. Bhimbra, "*Electrical Machinery*", Khanna Publications, 7th Edition, 2007. [2] A.E.Clayton, "*The Performance & design of D.C.Machines*", CBS publisher& Distributors,1st Edition, 2003 [3] A.E Fitzgerald and Charles Kinsley, "*Electric Machinery"*, TataMcGraw- Hill Education Publications, 6th Edition, 2002. [4] J.B Gupta, "Theory & Performance of Electrical Machines", S.K.Kataria& Sons, 15th Edition,2015
E-resources and other digital material	http://nptel.ac.in/courses/108105017/

17EE3304: NETWORK ANALYSIS – II

Course Category:	Programme core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 1 - 0
Prerequisites:	Linear Algebra and differential Equations(17MA1101) Network Analysis-I (17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will
	CO1	Analyze transient response of electric circuits.
	CO2	Find network functions and two-port parameters.
	CO3	Apply Fourier analysis to analyze electric circuits and design the
	CO4	Synthesize one port and two port networks.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO 1	PSO 2
CO1	H	M			H						M	H	H	
CO2	H	M	L		H							H	M	
CO3	H				H						L	H	M	
CO4	H		H		H							H	L	

Course Content

UNIT-I **[Text Book-1 &2]**

Transients: Review of Laplace transforms- Introduction, Direct current Transients – RL Transient, RC Transient, RLC Transient, two mesh transients. Alternating Current Transients - RL, RC, and RLC circuits, two mesh transients. (Both Differential equation and Laplace Transform approaches).Response of RL,RC and RLC circuits to Periodic functions.

UNIT–II **[Text Book-1]**

Network Function: Introduction, Driving point functions, Transfer functions; Analysis of ladder and non-ladder networks; Poles and Zeros of network functions; Restrictions on poles and zeros for driving- point and transfer functions. Time domain behavior from pole zero plot, Graphical method for determination of residue

Two Port Networks: Introduction, Open circuit impedance parameters, short circuit admittance parameters, transmission (ABCD) parameters, inverse transmission parameters, hybrid parameters, inverse hybrid parameters, Condition of symmetry and reciprocity in two port parameter representation, inter-relation between parameters of two port networks, inter connection of 2-port networks.

UNIT–III **[Text Book-1]**

Fourier Circuit Analysis: Introduction, Trigonometric form of the Fourier series, Wave form symmetry, Exponential form of the Fourier

	series, Average Value and RMS value of a periodic Complex wave, Power supplied by complex wave. **Filters**: Introduction, Classification of Filters, Characteristics of Filters, Low pass, high pass, band pass and band stop filters, Analysis and design of Filter networks of both T and π configurations.(constant k type filters only) **UNIT–IV** **[Text Book-1]** **Network Synthesis:** Introduction, Hurwitz polynomials and properties, Positive real functions and its properties, Elementary synthesis concepts, Realization of LC, RC and RL functions of one port and two port networks using Foster form and Cauer form.
Text books and Reference books	**Text Book(s):** [1] Ravish R Singh,"*Network Analysis and Synthesis*", 1st, Edition., McGraw-Hill Education (India) Pvt. Ltd., New Delhi. [2] A. Chakrabarthi, "*Circuit Theory (Analysis and Synthesis*)", 6th Edition., Dhanpat Rai & Co.(PVT) Ltd., 2013. **Reference Books:** [1] M.E Van Valkenburg, "*Network Analysis*", 3rd Edition Prentice Hall of India, (Pvt) Ltd, New Delhi. [2] W. H. Hayt, J.E. kemmerly and S. M. Durbin, "*Engineering Circuit Analysis*", 8th Edition, Tata McGraw-Hill, New Delhi, 2012 . [3] Charles K. Alexander, Matthew N. O. Sadiku, "*Fundamentals of Electric Circuits*", 5th Edition, McGraw-Hill, 2012. [4] A. Sudhakar and P.Shyam Mohan, "*Circuits and Networks Analysis and Synthesis*", 3rd Edition, Tata McGraw-Hill, New Delhi, 2007
E-resources and other digital material	[1] http://nptel.ac.in/courses/108102042/

17EE3305: DIGITAL ELECTRONICS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial - Practice:**	3 - 0 - 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	**Construct** the binary codes and **Elucidate** various logic families.
	CO2	**Design** and **Implement** combinational logic circuits.
	CO3	**Elucidate** Flip-Flops, Registers and Counters..
	CO4	**Design** and **Implement** Sequential Logic Circuits and Programmable Logic Devices.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**H**	**H**			**M**									**M**
CO2	**M**	**H**	**H**		**H**									**M**
CO3	**M**	**H**	**H**		**H**					**L**				**M**
CO4	**M**	**H**	**H**		**M**					**H**				**M**

Course Content

UNIT – I [**Text Book – 1& 2]**

Number Systems: Number systems and codes, error detection and correction codes**.**

Digital Logic Families: Introduction to RTL, DTL,I^2L, TTL, ECL and MOS Logic families, wired AND operation, characteristics of digital logic family, comparison of different logic families**.**

UNIT-II [**Text Book – 1 & 2]**

Minimization of Switching Functions: SOP and POS forms, K-map representations – minimization using K-maps- simplification**,** don't care conditions**,** Quine–Mc cluskey method.

Combinational Logic Design: Adders, subtractors, multiplexers and de-multiplexers, decoders and encoders, code converters, 1 Bit ALU

UNIT-III [**Text Book – 1 & 2]**

Sequential logic: 1-bit memory cell, SR, JK, D and T flip-flops level triggering and edge triggering, conversions of Flip-Flop**.**

Registers and Counters: Shift registers, Asynchronous and Synchronous type, Modulo counters, Ring counters.

	UNIT – IV [**Text Book – 1 & 2]** **Synchronous Sequential Logic circuits:** Moore and Mealy models, State diagrams, state assignment, State table and excitation tables, state reduction, Design of counters**.** **Programmable Logic Devices:** Read Only Memory, ROM organization, Design of a combinational circuit using a ROM, Programmable Logic Array (PLA), PLA Programming Table, and Programmable Array Logic (PAL).
Text books and Reference books	**Text Book(s):** [1] R P Jain, "*Modern Digital Electronics*", 4th Edition Tata Mc. Graw Hill Publication. [2] M. Morris Mano, "*Digital Logic and Computer Design*". Printice Hall of India, 2003. **Reference Books:** [1] Taub& Schilling, "*Digital integrated Electronics"*, McGraw-Hill [2] Anand Kumar, " *Fundamentals of Digital Circuits*", 2nd Edition, ". Printice Hall of India [3] Gordon J Deboo & Clifford N. Burrous, "*Integrated Circuits and Semiconductor Devices*", International Student Edition, 2nd Edition, Tata McGraw-Hill.
E-Resources	[1] **http://www.nptel.ac.in/courses/117106086/** [2] http://www.docstoc.com/docs/14901337/Fundamentals-of-Digital-Electronics [3] http://www.ebookee.com/Fundamentals-of-Digital-Electronics_313329.

17TP1306: LOGIC & REASONING

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by Doing	**Lecture - Tutorial - Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100M 0 M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Think reason logically in any critical situation
	CO2	Analyze given information to find correct solution
	CO3	To reduce the mistakes in day to day activities in practical life
	CO4	Develop time-management skills by approaching different shortcut methods
	CO5	Use mathematical based reasoning to make decisions
	CO6	Apply logical thinking to solve problems and puzzles in qualifying exams in any competitive exam.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						**M**								
CO2		**M**												
CO3						**M**								
CO4												**M**		
CO5				**M**										
CO6						**M**								

Course Content

UNIT-I:

1. Series Completion
2. Coding-Decoding
3. Blood Relation Blood
4. Puzzles test

UNIT II:

1. Direction sense test
2. Logical Venn diagrams
3. Number test, ranking test
4. Mathematical operations

UNIT III:

1. Arithmetical Reasoning
2. Inserting missing character
3. Syllogism.

	UNIT IV: Non – Verbal: 1. Water images 2. Mirror images 3. Paper folding 4. Paper cutting 5. Embedded Figures 6. Dot situation 7. Cubes & Dice
Text books and Reference books	**Text Book(s):** [1] R. S. Aggarwal, " *Verbal and non-verbal reasoning*", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551.
E-Resources	

17EE3351: NETWORKS &ELECTRICAL MACHINES-I LAB

Course Category:	**Programme core**	**Credits:**	1.5
Course Type:	Practical	**Lecture - Tutorial - Practice:**	0 -0– 3
Prerequisites:	Network Analysis-I(17EE1204) Electrical machines-I(17EE3303)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Design and conduct experiment.
	CO2	Analyze and present experimental results.
	CO3	Exhibit professional behavior

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M -Medium, H – High)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1		**H**	**M**	**H**			**L**					**H**	**H**
CO2		**M**		**H**			**H**					**H**	**H**
CO3		**M**		**H**			**H**						

Course Content

Electric Networks:

1. Verification of KCL & KVL
2. Verification of Thevenin's & Maximum power transfer theorems
3. Verification of Superposition & Reciprocity theorems.
4. Estimation of self & mutual inductance of coupled circuits
5. Determination of Z, Y parameters of a given two port network
6. Series and Parallel Resonance
7. Measurement of voltage and current in RLC circuit
8. Voltage, Current and Power measurements in balanced and unbalanced three phase circuits using resistors

DC Machines:

1. No load & load characteristics of separately excited DC generator.
2. Load characteristics of DC compound generator with differential and cumulative connections
3. Speed control of DC shunt motor

		4. Brake test on DC shunt and compound motor 5. Load test on DC Series Motor 6. Swinburne's Test on DC shunt motor 7. Hopkinson's test on DC motor-generator set 8. Retardation test on DC shunt motor 9. Field test on DC Series Motors **Transformers:** 1. Open circuit and short circuit tests on single phase transformer 2. Load test on single phase transformer 3. Sumpner's test on single phase transformers 4. Separation of no-load losses in single phase transformer. 5. Parallel operation of single phase transformers 6. Load test on three phase transformer 7. Scott connection of three phase transformers 8. Open circuit and short circuit tests on three phase transformer

NOTE: In all laboratories a minimum of 10 experiments are to be completed.
(Minimum three experiments from networks, machines and transformers)

17EE3352: ELECTRONIC CIRCUITS LAB-I

Course Category:	Program core	**Credits:**	1.5
Course Type:	**Practical**	**Lecture - Tutorial - Practice:**	0 - 0 - 3
Prerequisites:	Electronic Circuits(17EE3302)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Design and conduct experiment.
	CO2	Analyze and present experimental results.
	CO3	Exhibit professional behavior

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	H	H			L						M			M
CO2	H	H						L						M
CO3		H				L								M

Course Content

1. Electronic Components Testing (Diode, Transistors, LED, Photo-Diode, Capacitor Nomenclature, ICs, Colour Coding of Resistors) and CRO Basics.
2. Demo of making PCB using Screen Printing.
3. PCB Design –I (Schematic)
4. PCB Design –II (Rooting)
5. PCB Design –III (Etching Process)

Electronics Devices Lab

1. Characteristics of PN Junction Diode
2. Characteristics of Zener Diode
3. Characteristics of LED and Photo Diode
4. Analysis of Half Wave Rectifiers with and without filter
5. Analysis of Full Wave Rectifiers with and without filter.
6. Characteristics of Transistor in Common Base Configuration
7. Characteristics of Transistor in Common Emitter Configuration
8. Verification of Transistor Self-Bias Circuit.
9. Characteristics of Junction Field Effect Transistor.
10. Characteristics of Uni-Junction Transistor.

Digital Electronics Lab

1. Realization of logic gates Using Discrete Components and Universal gates.
2. Implementation of the given Boolean Function Using Logic Gates in

	both SOP and POS forms. 3. Design of Binary to Gray and Gray to Binary Converters. 4. Verification of Flip-Flops Using Logic Gates. 5. Implementation of 4-bit Parallel Adder/ Subtract or Using IC 7483. 6. Design of BCD to 7-segment display driver. 7. Design and Verification of Shift registers. 8. Design of modulo – N counter 9. Design of 1-bit Arithmetic Logic Unit (ALU). 10. Design and Verification of Synchronous and Asynchronous counters using flip flops and IC 74163.

NOTE: In all laboratories a minimum of ten experiments are to be completed. Minimum five from Electronic Devices and Minimum five from Digital Electronics

17MC1307B: INDIAN CONSTITUTION

Course Category:	Institutional Core	**Credits:**	-
Course Type:	Theory	**Lecture - Tutorial - Practice:**	2-0-0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	To understand the spirit and origin of the fundamental law of the land.
	CO2	To understand how fundamental rights can be protected .
	CO3	To understand the structure and formation of the Indian Government at center as well as state.
	CO4	To understand when and how an emergency can be imposed and its consequences.

Contribution of Course Outcomes towards Achievement of Program outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														

Course Content

UNIT I:

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

UNIT II:

Fundamental Rights under Indian constitution, scheme of the fundamental Rights, Scheme of the fundamental Right to Equality, Scheme of the fundamental Right to certain freedoms under Article 19 Scope of the right to life and personal Liberty under Article 21.

UNIT III:

Federal structure and distribution of legislative and financial powers between the union and the states, Parliamentary form of government in India-the constitution powers and status of the President of India, Amendment of the constitutional powers and procedure, The historical perspectives of the constitutional amendments in India, Local self

	government-Constitutional Scheme in India. **UNIT IV:** Emergency Provisions, National Emergency, President Rule, Financial Emergency
Text books and Reference books	**Text Book(s):** [1] "The Constitution of India", 1950 (Bare Act), Government Publication. [2] Dr. S. N. Busi, Dr. B. R. Ambedkar, "*Framing of Indian Constitution*", 1st Edition, 2015. [3] M. P. Jain, "*Indian Constitution Law*", 7th Edition., Lexis Nexis, 2014. [4] D.D. Basu, "*Introduction to the Constitution of India*", Lexis Nexis, 2015.

SEMESTER IV

Contact Hours: 27

S.No	Course Code	Course	L	T	P	Credits
1.	17EE3401	Linear Control Systems	3	0	0	3
2.	17EE3402	Electrical Measurements	3	0	0	3
3.	17EE3403	Electrical Machines – II	3	1	0	4
4.	17EE3404	Digital Signal Processing	3	1	0	4
5.	17TP1405	English for Professionals	0	0	2	1
6.	17HS2406	Humanities Elective	1	0	0	1
7.	17EE3451	Electrical Machines – II Lab	0	0	3	1.5
8.	17EE3452	Control Systems & Measurements Lab	0	0	3	1.5
9.	17HS1453	Communication Skills Lab	0	0	2	1
Total			**13**	**2**	**10**	**20**
10	17MC1407A	Environmental Studies (EIE/CE/ME/EEE)	2	0	0	-

List of Humanities Electives

A: Yoga & Meditation
B: Music
C: Human Rights and Legislative Procedures
D: Philosophy
E: Development of societies
F: Visual Communication
G: Film Appreciation
H : Sanskrit Bhasa
I1: Foreign Languages (French)
I2: Foreign Languages (Germany)
J: Psychology

17EE3401: LINEAR CONTROL SYSTEMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture- Tutorial-Practice:**	3 -0 - 0
Prerequisites:	Network Analysis –I (17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70 M 100 M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Determine transfer function models of electrical, and mechanical systems
	CO2	Analyze the behaviour of the system under time domain approach and graphical method.
	CO3	Apply various plots to analyze the behaviour of the system under frequency domain approach.
	CO4	AnalyzeState space models of various systems

Contribution of Course Outcomes towards achievement of Program Outcomes

(M-Medium, H–High, L-Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	**H**	**L**			**H**				**L**					
CO2	**H**	**L**			**H**				**L**					
CO3	**H**	**L**			**H**				**L**					
CO4	**H**	**L**			**H**				**L**					

Course Content

UNIT-I **[Text Book-1]**

Introduction: Control system terminology, examples of simple control systems, open loop and closed loop control systems, effect of feedback on overall gain, stability, sensitivity, external noise; types of feedback control systems – linear, nonlinear, time invariant and time varying systems.

Mathematical Models of Physical Systems: Formulation of differential equations for Electrical and Mechanical systems, transfer functions of systems ,analogous systems, characteristic equation of feedback systems, poles and zeros, block diagram representation of control systems, block diagram algebra, signal flow graph, Mason's gain formula.

UNIT-II **[Text Book - 1]**

Time Domain Analysis: Standard test signals – step, ramp, parabolic and impulse; Time response of first-order system to standard test signals, step response of second order system, time domain specifications, steady state error and static error constants, P, I, PI, PD and PID control actions.

Stability Analysis in Complex Plane: Stability definitions, Stability study

	based on poles of closed-loop transfer function, Routh–Hurwitz criterion. Root locus concept, magnitude and angle conditions, properties and construction of the root loci (**For positive values of K only**) **UNIT–III** **[Text Book-1]** **Frequency Domain Analysis:** Introduction, frequency domain specifications, correlation between time and frequency response, polar plot, Bode plot, phase margin and gain margin - Principle of argument, Nyquist stability criterion. **UNIT IV** **[Text Book- 1]** **State Space Analysis:** Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability.
Text books and Reference books	**Text Book(s):** [2] I.J. Nagrath & M.Gopal , "*Control Systems Engineering* ", 5th Edition. New Age publisher. [3] A. Ananda Kumar, "*Control Systems*", 2nd Edition, Printice Hall of India publishers, 2014. **Reference Books:** [4] K. Ogata , "*Modern Control Engineering*", 5th Edition., Printice Hall of India publishers, 2010. [1]. B.C. Kuo, "*Automatic Control Systems with MATLAB programming*", 7th Edition, Printice Hall of India publishers. [5] Schaum's Series , "*Feedback and control systems*", 2nd Edition, Tata McGraw Hill (Pvt) Ltd.
E-resources and other digital material	[1] www.nptel.ac.in/courses/108101037/ [2] www.dis.uniroma1.it/~lanai/controlsystems/cs_lectures_enhtml

17EE3402: ELECTRICAL MEASUREMENTS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3 -0-0
Prerequisites:	Engineering Physics(17PH1202) Network Analysis-I(17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Elucidate the basic laws governing the operation of electrical measuring instruments and measure electrical quantities like Voltage and Current, error analysis.
	CO2	Understand the concepts used in measurement of Power, energy, phase and frequency.
	CO3	Understand the significance and working of instrument transformers and bridges used for electrical measurements
	CO4	Elucidate the concepts of digital voltmeters and Cathode Ray Oscilloscope used for electrical measurements.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PS O1	PS O2
CO1	**H**	**L**	**M**										**M**	
CO2	**M**	**H**							**L**				**M**	
CO3	**H**	**H**	**M**											**M**
CO4	**M**	**M**	**M**						**L**				**M**	

Course Content

UNIT-I **[Text book 1]**

Analog Instruments: Classification of analog Instruments, principles of operation. Electro-Mechanical indicating instruments – operating forces, control systems, damping systems.

Analog Ammeters and Voltmeters: Permanent Magnet Moving Coil Instruments, Moving Iron Instruments, Electrodynamometer Instruments, (Construction, General Torque equation, shape of scale, advantages, disadvantages and errors)

Error Analysis - Classification, combination of quantities.

UNIT-II **[Text Book 1]**

Measurement of Power & Energy: Electrodynamometer wattmeters – Construction, theory, shape of scale, errors. Low power factor dynamometer wattmeters, Measurement of Reactive power. Single phase Induction type Watt-hour meters (Construction, theory of operation and adjustments), testing of Energy meters by direct loading and phantom loading arrangements.

Measurement of Phase and Frequency:

	Power Factor meters – Electrodynamometer, Frequency meters – Mechanical Resonance and Electrical Resonance Frequency meters. Synchro scopes – Moving Iron Synchro scopes. **UNIT-III** **[Text Book -1]** **Instrument Transformers:** Current Transformers – Theory, Ratio error and phase angle errors, Reduction of errors, effect of Secondary open circuit, testing of Current Transformers using Mutual Inductance method. Potential Transformers - Theory, Ratio error and phase angle errors, Reduction of errors **DC & AC Bridges:** Measurement of Resistance - Wheatstone bridge, Kelvin double bridge. Measurement of Self Inductance - Maxwell's bridge, Anderson's bridge. Measurement of Capacitance –Schering bridge. **UNIT-IV** **[Text Book - 1]** **Digital Voltmeters:** Ramp, Integrating and potentio-metric digital voltmeters. **Cathode Ray Oscilloscopes:** Basic CRO Circuits, Observation of Waveform on CRO, Measurement of Voltages and currents, measurement of phase and frequency(Lissajous Patterns), multi input oscilloscopes, dual trace oscilloscopes, dual beam oscilloscope.
Text books and Reference books	**Text Books:** [1]. A.K.Sawhney, "*A course in Electrical & Electronic Measurements and Instrumentation*",,19th Edition, Dhanapth Rai & Co., New Delhi, 2013. **Reference Books:** [1]. J.B.Gupta, "*A course in Electronic & Electrical Measurements and Instrumentation*", S. K. Kataria & Sons, New Delhi, 2009. [2]. E.W.Golding and F.C.Widdis, "*Electrical Measurements and measuring instruments*", 5th Edition, Wheeler Publishers, New Delhi, 2009.
E-resources and other digital material	http://nptel.ac.in/syllabus/108106070/

17EE3403: ELECTRICAL MACHINES – II

Course Category:	Programme core	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 1 - 0
Prerequisites:	Electrical Machines-I(17EE3305)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	Understand the constructional details and principle of operation of synchronous generators.
CO2	Analyze the performance of the synchronous motor and its
CO3	Understand the constructional details and principle of operation of three phase AC induction motor and speed control methods
CO4	Analyze the starting methods of single phase AC induction motor and performance of special electrical machines

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	L	H	H		H		H						H	
CO2	M	H			H		H						H	
CO3	M	H	H		H		H						H	
CO4	L	H	H		H		H						H	

Course Content

UNIT–I **[Text Book-2]**

Synchronous Generators: Construction –types of rotors- winding factors - EMF equation -armature reaction-phasor diagram of non-salient pole synchronous generator- synchronizing with infinite bus- parallel operation-synchronizing torque- effect of variation of excitation and mechanical input - losses and efficiency - voltage regulation – direct load, EMF, MMF, and ZPF methods - two reaction theory of salient pole machine-phasor diagram-slip test.

UNIT–II **[Text Book-2]**

Synchronous Motor: Principle of operation- torque equation -phasor diagram –different torques- effects of varying excitation- minimum and maximum power for a given excitation -V and inverted V curves - hunting and its suppression –measurement of X_d and X_q - efficiency-synchronous condenser- starting of synchronous motors- application of synchronous motors

UNIT–III **[Text Book-1]**

	Three Phase Induction Motor And Speed Control Methods: Construction- rotating magnetic field- operation of squirrel cage and slip ring 3-phase induction motors- torque equation - torque-slip characteristics- equivalent circuit-losses and efficiency- testing of induction motors and circle diagram-separation of losses -induction generators and their applications-types of starters-speed control of induction motors-stator voltage control- frequency control- V/f control- pole changing- injection of EMF into rotor circuit **UNIT-IV** **[Text Book-1]** **Single Phase Induction Motors:** Construction-double field revolving theory- equivalent circuit- No-load and blocked rotor test-starting methods – split phase, capacitor start and run motor. **Special Electrical Machines:** Shaded pole motors and their characteristic-applications-linear induction motor-repulsion motor-hysteresis motor, BLDC Motor – Stepper motors.
Text books or Reference books	**Text Book(s):** [1] I.J.Nagrath and D.P. Kothari, " *Electric Machines*", Tata McGraw-Hill Education Private Limited Publishing Company Ltd, 4th Edition, 2010. [2] AshfaqHusain, *"Electric Machines"*, Dhanpat Rai & Co.(Pvt.) Ltd, 2nd Edition, 2009 **Reference Books:** [1] Dr.P.S.Bhimbra, "*Electrical Machinery"*, Khanna Publications, 7th Edition, 2007. [2] A.E Fitzgerald and Charles Kinsley, 'Electric Machinery', Tata McGraw- Hill Education Publications, 6th Edition, 2002. [3] Alexander S.Langsdorf, "*Theory of Alternating- Current Machinery"* Tata McGraw- Hill Publications, 2001. [4] J.B Gupta, "*Theory & Performance of Electrical Machines"*, S.K.Kataria & Sons, 15th Edition,2015
E-resources and other digital material	http://nptel.ac.in/courses/108105017/

17EE3404: DIGITAL SIGNAL PROCESSING

Course Category:	**Programme core**	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 1 - 0
Prerequisites:	Transformations and Numerical Methods(17MA1301C)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Identify** and **Categorize** discrete time systems.
	CO2	**Analyze** discrete systems using Z transforms.
	CO3	**Apply** DFT to discrete systems and evaluate DFT using Fast Fourier and Transforms.
	CO4	**Design** FIR and IIR filters and Realize digital filters..

Contribution of Course Outcomes towards achievement of Program Outcomes

(M-medium, H–High,L-Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H				H		H							
CO2	H						H							
CO3	H				H		H							
CO4	H				H		H							

Course Content

UNIT-I **[Text Book - 1]**

Discrete Signals and Systems: Introduction to digital signal processing, Advantages and applications, Discrete time signals, LTI system: Stability and causality, Frequency domain representation of discrete time signals and systems

Z-Transforms: Z-transforms, Region of convergence, Z-transform theorems and properties, Relation between Z-transform and Fourier transform of a sequence, Inverse Z-transform using Cauchy's integration theorem, Partial fraction method, Long division method, Solution of difference equations using one sided Z-transform, Frequency response of a stable system.

UNIT-II **[Text Book - 2]**

	DFT and FFT: Discrete Fourier Series, Properties of DFS, Discrete Fourier Transform, Properties of DFT, Linear convolution using DFT, Computations for evaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFT algorithm, Computation of inverse DFT. **UNIT-III** **[Text Book - 2]** **IIR Filter Design Techniques:** Introduction, Properties of IIR filters, IIR filter design using bilinear transformation and impulse Invariance methods; Design of Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods. Design of digital filters using frequency transformation method. **UNIT-IV** **[Text Book - 2]** **FIR Filter Design Techniques:** Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: Rectangular window, Hanning window, Hamming window, Generalized Hamming window, Bartlett triangular window, Comparison of IIR and FIR filters. **Realization of Digital Filters:** Direct, Canonic, Cascade, Transposed, Parallel and Ladder realizations
Text books and Reference books	**Text Book:** [1] Alan V Oppenheim and Ronald W Schafer, "Digital Signal Processing Pearson Education", Printice Hall of India, 2004 . [2] Proakis, J. Gard and D. G. Manolakis, "Digital Signal Processing Principals, Algorithms and applications" , 3rd Edition, Printice Hall o India, 2003. **Reference Books:** [1] M.H.Hayes, "*Digital Signal Processing*", Tata Mc. Graw Hill Publication. [2] P.Ramesh Babu, "*Digital Signal Processing*", 2nd Edition. Scitech Publications, 2004. [3] S K Mitra, "*Digital Signal Processing: A Computer Based Approach*", 2nd Edition., Tata Mc. Graw Hill Publication, 2003 [4] S.Salivahanan ,"*Digital Signal Processing",* Tata Mc. Graw Hill Publication, 2000.
E-resources and other digital material	[1] www.dsptutor.freeuk.com [2] https://nptel.iitm.ac.in/courses/Webcourse contents/ IITKANPUR/ Digi_Sign_Pro/ ui**/** About-Faculty.html

17TP1405: ENGLISH FOR PROFESSIONALS

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100M 0 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Present themselves effectively in the professional world by shedding off their inhibitions about communicating in English
	CO2	Introduce themselves as well as others appropriately.
	CO3	Use vocabulary to form sentences and narrate stories by using creative thinking skills
	CO4	Involve in practical activity oriented sessions.
	CO5	Learn about various expressions to be used in different situations.
	CO6	Respond positively by developing their analytical thinking skills.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									**H**	**H**				
CO2										**H**				
CO3										**H**				
CO4									**H**	**H**				

Course Content

UNIT-I

1. Beginners, Functional, Situational Conversations
2. Practicing on Functional Conversations.

UNIT-II

1. Errors in usage of Parts of Speech with a thrust on Verbs, Adjectives and Conjunctions, Idioms/Phrases.
2. B. Introducing Basic Grammar
3. C. Practicing on Functional Conversations.

UNIT-III

1. Introducing Self & Others
2. Structures and Forming Sentences
3. Telephonic Etiquette, Social Etiquette and Table Manners
4. Practicing on Functional Conversations.

UNIT-IV

1. Direct, Indirect/Reporting Speech
2. Public Speaking Basics
3. Versant Test Preparation

	4. Practicing on Situational Conversations.
Text books and Referenc e books	[1]. Swaroopa Polineni, "Strengthen Your Communication Skills", 1st Edition, Maruthi Publications, 2013. ISBN:978-81-907052-2-6. [2]. Mamta Bhatnagar & Nitin Bhatnagar, **"***Communicative English***",** 1st Edition, Pearson India, 2010. ISBN:8131732045

17HS2406 (A): YOGA & MEDITATION

Course Category:	**Humanities elective**	**Credits:**	1
Course Type:	Practice	**Lecture - Tutorial - Practice:**	1- 0 -0
Prerequisites:		**Continuous Evaluation:**	100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Equip better attitude and behavior
	CO2	Imbibe set of values enabling a balanced life focused on an ethical material life.
	CO3	Develop levels of concentration through mediation.
	CO4	Apply conscience for the missions of life.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	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						M								
CO2						M								
CO3						M								
CO4						M								

Course Content

UNIT I

Understanding Yoga: Orientation, Introduction to Values, the positive impact of yoga, application of values in real life, universal values**.**

(Lecture-demo pattern with illustrations representing Yogic postures and value system related pictorial is followed.

UNIT II

Yoga Practices: Yoga, self and ultimate goal of yoga, introduction to various types of yoga ,integration of values in yoga

(Activity based processes with Assanas and pranayama are implemented)

UNIT III

Practice Of Meditation: Art of meditation, observation, introspection, contemplation meditation and concentration.

(**Activity based processes with meditation sessions followed by demonstration are implemented**.)

UNIT-IV

Towards professional excellence through yoga and meditation: Stress management, choices we make, Excellence and integration.

(Lecture-demo pattern is followed)

Text books and Reference books		**Text Book(s):** [1] Common Yoga protocol, Ministry of Ayush, Govt of India . [2] O Journey of the Soul- Michael Newton, 2003, Llewellyn 2010. **Reference Books:** [1] Lectures from Colombo to Almora, Swami Vivekananda, 2010 Ramakrishna mission. [2] Essays of Ralph Waldo Emerson, 1982, Eastern press
E-resources and other digital material		www.heartfulness.org accessed on 27th April 2018 www. *ayush.gov.in accessed on* 27th April 2018 www. belurmath.org *accessed on* 27th April 2018

17HS2405 (D) : PHILOSOPHY

Course Category:	**Humanities elective**	**Credits:**	1
Course Type:	Theory	**Lecture - Tutorial - Practice:**	1- 0 - 0
Prerequisites:		**Continuous Evaluation:**	100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** major philosophical issues
	CO2	**Appreciate** the philosophical doctrines of western thinkers. Appreciate the philosophical doctrines of western thinkers.
	CO3	**Understand** the eminence of Indian classical thought
	CO4	**Appreciate** relation between science and values .

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1						M								
CO2						M								
CO3						M								
CO4								M						

Course Content

UNIT I
What's Philosophy : Definition, Nature, Scope and Branches .

UNIT II
Introduction to Western philosophy : Ancient Greek and Modern philosophy

UNIT III
Introduction to Indian Thought: Six systems – Modern philosophers .

UNIT IV
Philosophy of science & Technology : Human values and professional Ethics .

Text books and Reference books

Text Book(s):
[1] Will Durant, Simon & Schuster aborti, *" The story of philosophy ",* 1926.
[2] O.O.Fletcher, *" An Introduction to philosophy "* Word Public Library 2010.
Reference Books:
[1] DH Dutta , *" Six systems of Indian Philosophy ",*
[2] Will Duran, Simon & Schuster ," *The pleasures of philosophy* ",1929

E-esources and other digital material

17HS2405 {I2} – FOREIGN LANGUAGE (GERMAN)

Course Category:	**Humanities elective**	**Credits:**	1
Course Type:	Theory	**Lecture - Tutorial - Practice:**	1- 0 – 0
Prerequisites:		**Continuous Evaluation:**	100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Learn basics of German Language.
	CO2	Write German Writing
	CO3	Understand German Hearing
	CO4	Form sentence in Present , past and future tense

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
	CO1										M				
	CO2										M				
	CO3										M				
	CO4										M				

Course Content		**UNIT I** Alphabets, Numbers, Exact articles and not exact Articles. **UNIT II** Prepositions**,** Present Tense . **UNIT III** Past Tense and about family. **UNIT IV** Future Tense
Text books and Reference books		**Text Book(s):** [1] Studio d A1Cornelsen Goyalaas Publications New Delhi .
E-resources and other digital material		

17HS2405 (J) – PSYCHOLOGY

Course Category:	**Humanities elective**	**Credits:**	1
Course Type:	Theory	**Lecture - Tutorial - Practice:**	1- 0 - 0
Pre-requisite		**Continuous Evaluation:**	100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** major philosophical issues
	CO2	**Appreciate** the philosophical doctrines of western thinkers. Appreciate the philosophical doctrines of western thinkers.
	CO3	**Understand** the eminence of Indian classical thought
	CO4	**Appreciate** relation between science and values .

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		**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						**M**								
	CO2						**M**								
	CO3						**M**								
	CO4								**M**						

Course Content		**UNIT I** **What's Philosophy:** Definition, Nature, Scope and Branches . **UNIT II** **Introduction to Western philosophy :** Ancient Greek and Modern philosophy **UNIT III** **Introduction to Indian Thought:** Six systems – Modern philosophers . **UNIT IV** **Philosophy of science & Technology** : Human values and professional Ethics .
Text books and Reference books		**Text Book(s):** [1] Will Durant, Simon & Schuster aborti, *" The story of philosophy "*, 1926. [2] O.O.Fletcher, *" An Introduction to philosophy "* Word Public Library 2010. **Reference Books:** [1] DH Dutta , *" Six systems of Indian Philosophy "*, [2] Will Duran, Simon & Schuster ," *The pleasures of philosophy* ",1929
E-resources and other digital material		

17EE3451: ELECTRICAL MACHINES-II LAB

Course Category:	Programme core	Credits:	1.5
Course Type:	Practical	Lecture-Tutorial - Practice:	0 - 0 – 3
Prerequisites:	Networks & Electrical Machines-I Lab (17EE3351)	Continuous Evaluation: Semester end Evaluation: Total Marks:	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	Design and conduct experiment.											
	CO2	Analyze and present experimental results.											
	CO3	Exhibit professional behavior											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO1 1**	**PSO 1**	**PSO2**
	CO1	**H**	**L**	**H**								**L**	**H**	
	CO2			**H**				**H**					**H**	
	CO3			**H**				**H**						

Course Content

Electrical Machines Lab

1. Regulation of 3 - phase alternator by EMF& MMF methods.
2. Regulation of 3 - phase alternator by ZPF method.
3. Regulation of 3 - phase salient pole alternator by slip test.
4. Load test on 3 - phase alternator.
5. Synchronization and parallel operation of three phase alternator.
6. Measurement of negative sequence and zero sequence impedance of alternator.
7. Slip test on a salient pole synchronous motor.
8. V and inverted V curves of three phase synchronous motor.
9. Load test on 3 - phase squirrel cage induction motor.
10. Load test on 3 - phase slip ring induction motor.
11. No load and blocked rotor test on 3 - phase induction motor.
12. Separation of losses in 3-phase induction motor.
13. Load test on Induction generator.
14. Brake test on single phase induction motor
15. Determination of equivalent circuit of single phase

		induction motor 16. Modeling and simulation of three phase Induction motor using MATLAB

NOTE**: (A** minimum of 10 experiments are to be completed.)

17EE3452 – CONTROL SYSTEMS & MEASUREMENTS LAB

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture- Tutorial-Practice:**	0 -0 - 3
Prerequisites:	Linear Control Systems (17EE3401); Electrical Measurements(17EE3402)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70 M 100 M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Design and conduct experiment.
	CO2	Analyze and present experimental results.
	CO3	Exhibit professional behavior

Contribution of Course Outcomes towards achievement of Program Outcomes (M-Medium, H–High,L-Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	**H**	**H**				**L**	**M**							**M**
CO2	**M**	**H**			**L**		**M**							**H**
CO3						**L**								

Course Content

Control systems:

1. Characteristics of Synchros
2. Transfer function of D.C generator.
3. Time response of second order system.
4. Characteristics of magnetic amplifier.
5. Characteristics of A.C servo motor.
6. Effect of PID controller.
7. State Space analysis using Simulation.
8. Stability studies of Mechanical System using Simulation.

Measurements:

1. Kelvin Double Bridge - Measurement of low resistance.
2. Anderson Bridge – Measurement of Inductance.
3. Schering bridge - Measurement of Capacitance.
4. Calibration of Single-phase energy meter by direct loading.
5. Calibration of Single-phase energy meter by phantom loading.
6. Measurement of frequency using Lissajous patterns.
7. Measurement of Ratio error and Phase angle error of C.T.
8. Measurement of Earth resistance by Earth tester.

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

NOTE: (In both laboratories a minimum of 5 experiments are to be completed.)

17HS1453: COMMUNICATION SKILLS LAB

Course Category:	Institutional core	**Credits:**	1
Course Type:	**Practical**	**Lecture - Tutorial - Practice:**	0 - 0 - 2
Prerequisites:	Technical English and Communication skills (17HS1205)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Be proficient in pronunciation of speech sounds including accentuation.
	CO2	Enhance the awareness of the elements of listening comprehension.
	CO3	Develop the abilities of rational argumentation and skills of public speaking.
	CO4	Be aware of the elements of professional communication
	CO5	Be exposed to the items of various competitive exams.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1							H	H	M			L		
CO2		M		H	M	M	H	H	M	H		M		
CO3	H	H	M	H		H	H	M	M	H	L	H		
CO4	M	M	M	H	L	H	H	H	H	H	L	H		
CO5		M	M	M	M	H	H	L	H	H	L	L		

Course Content

UNIT: I

Elements of Spoken Expression and processes of Listening comprehension:

- Speech Mechanism
- Articulation of vowels and consonants
- Patterns of Accentuation
- Types and processes of Listening comprehension

UNIT: II

Patterns of Substantiation and Refutation in Public Speaking:

- Group Discussion (Open and Monitored)
- Pyramid Discussion
- PNI
- Seminar Talk and Power Point Presentation.

	UNIT III **Professional Communication:** ➢ Self Affirmation ➢ Textual Patterns ➢ Advanced Composition including Memo and e-mail ➢ Résumé Preparation ➢ Elements of Non-Verbal Communication. **UNIT IV** **Life Skills and Vocabulary for Competitive Examinations:** ➢ Select Life Skills(50) ➢ Select Logies, Isms, Phobias and Manias (25 each) ➢ Sentence Completion and Double unit Verbal Analogies(50 items) ➢ Fundamentals of Syllogisms(Descriptive and Pictorial)
Text books and Reference books	**Text Book(s):** [1] Martin Cutts, "*Oxford Guide to Plain English*", 7th Impression, OUP, 2011 [2] Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21st Impression, 2003 **Reference Books:** [1] Stephen R Covey, "*The 7 Habits of Highly Effective people*", 2nd Edition, (Pocket Books) Simon and Schuster UK Ltd, 2004 [2] Eclectic Learning Materials offered by the Department
E-resources and other digital material	[1] ODll Language Learner's Software, 27-6-2012 Orell Techno Systems , [2] Visionet Spears Digital Language Lab software Advance Pro , 28-01-2015 [3] www.natcorp.ox.ac.uk, *British National Corpus, XML edition 2007.*

17MC1407A- ENVIRONMENTAL STUDIES
(Common for (EIE/CE/ME/EEE))

Course Category:	Mandatory Course	**Credits:**	**Non-Credit**
Course Type:	Theory	**Lecture - Tutorial - Practice:**	**2 - 0 - 0**
Prerequisites:	Conservation and Preservation of Environment	**Continuous Evaluation: Semester end Evaluation: Total Marks:**	**100M - 100M**

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Understand the various natural resources, analyze and explore.
	CO2	Understand the Ecosystems and need of Biodiversity
	CO3	Realize and Explore the Problems related to Environmental pollution
	CO4	Apply the Role of Information Technology and analyze social issues degradation management and its management Acts associated with Environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L							H				L		
CO2			L				L	H						
CO3				L		H								
CO4				L				H	H					

Course Content

UNIT I

[Text Book-1]

The Multidisciplinary Nature of Environmental Studies:

Definition, scope and importance, Need for public awareness.

Natural Resources: Renewable and Non-renewable Resources:

Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture,

fertilizer-pesticide problems, water logging, salinity.

(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-II **[Text Book-1]**

Ecosystems:

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem-Forest ecosystem ,Grassland ecosystem, Desert ecosystem ,Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation:

Introduction, definition- genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity-consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, 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.

UNIT-III **[Text Book-1]**

Environmental Pollution

Definition ,Causes, effects and control measures of

(a)	Air pollution	(b)	Water pollution
(c)	Soil pollution	(d)	Marine pollution
(e)	Noise pollution	(f)	Thermal pollution
(g)	Nuclear hazards		

Solid waste management-Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Disaster management: Floods, earthquake, cyclone and landslides

UNIT-IV **[Text Book-1]**

Social Issues and the Environment

From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns, Environmental ethics- Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wastel and reclamation, Consumerism and waste products.

Environment Protection Act: Air (Prevention and Control of

	Pollution) Act., Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness. **Human Population and the Environment:** Population growth, variation among nations, Population explosion—Family Welfare Program., Environment and human health, Human rights, Value education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in environment and human health. **Field Work/Case Studies (**Not To Be Included In Semester End Exams**)** Visit to a local area to document environmental assets - river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.
Text books and Reference books	**Text Book(s):** [1] Text book for "*Environmental Studies*" for under graduate courses of all branches of higher education – Erach Bharucha -- For University Grants Commission **Reference Books:** [1] AnjaneyuluY, "*Introduction to Environmental sciences",*B S Publications PVT Ltd, Hyderabad
E-resources and other digital material	colleges@edu.ac.in/UG/Envinromental%20**Studies**_ebook.**pdf**

17EE3501 - Power Systems-I

Course Category:	**Programme core**	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial -Practice:**	3- 1 - 0
Prerequisites:	Engineering Physics(17PH1202) Network Analysis-I(17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:												
	CO1	**Understand** the layout of power system and **Elucidate** conventional power generating plants.												
	CO2	**Analyze** the performance of transmission lines.												
	CO3	**Evaluate** the performance of AC and DC distribution systems.												
	CO4	**Understand** the economical aspects of power generation.												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
	CO1	**M**		**H**				**H**	**H**					**H**	
	CO2	**H**	**H**			**H**		**H**						**H**	
	CO3	**M**				**H**		**H**						**H**	
	CO4	**M**	**M**			**H**		**H**	**M**					**H**	

Course Content

UNIT I: **[Text Book – 1& 2]**

Introduction: Evolution of power systems and present day scenario-power system layout- bulk power grids and micro-grids.

Thermal and Hydroelectric power stations: Introduction - selection of site for thermal station -layout -main parts and working; factors for site selection of hydro electric station - hydrology - classification of hydroelectric plants - general arrangement and operation of hydroelectric plants and its function.

Nuclear power stations: Introduction-nuclear reactions-nuclear materials-feasibility of nuclear power station-main parts of reactors and their functions-types of reactors-Boiling Water Reactor (BWR) and Pressurized Water Reactor (PWR)-working of nuclear power stations.

UNIT II: **[Text Book – 1&2]**

Constants of overhead transmission lines: Introduction-inductance of a conductor due to internal & external fluxes-inductance of a single phase two wire line-inductance of composite conductor lines-inductance of 3 phase lines-capacitance of a two wire line-capacitance of 3 phase lines-effect of earth on capacitance of line.

Performance of transmission lines: Introduction - Representation of short, medium and long length transmission lines- ABCD constants for short and medium lines–Ferranti effect-surge impedance and surge impedance loading- corona.

UNIT III: **[Text Book - 1]**

DC Distribution: Introduction and classification of distribution systems, Voltage drop calculations in DC distributors-radial distributor fed at one end and at both ends-equal/unequal voltages

		with concentrated loads and ring main distributor. **AC Distribution:** Voltage drop calculations in AC distributors - power factors referred to receiving end voltage and with respect to load voltages. **UNIT IV:** **[Text Book - 1]** **Economical aspects:** Economics of generation-significance of load curve-load duration curve-load factor, diversity factor, plant use factor, cost of electrical energy, choice of size and number of generator units, methods of determining depreciation-tariffs. **Power factor considerations**: Causes of low power factor-methods of improving power factor, most economical power factor for constant KW load and constant KVA type loads.
Text books and Reference books		**Text Book:** [1] M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A. Chakraborti," *Power System Engineering*", Dhanpat Rai & Co. Pvt. Ltd., 2016. [2] C L Wadhwa, "Generation Distribution and utilization of *Electrical Energy"*, New age International 4th Edition. **Reference Books:** [1] John J. Grainger, William D. Stevenson, "Power System Analysis", 4th Edition, Mc.Graw Hill, 1994 [2] V.K.Mehta, Rohit Mehta, "Principles of Power Systems" S. Chand, 4th Revised Edition. [3] J.B. Gupta , "*Transmission & Distribution of Electrical Power*", S. K. Kataria& Sons, 2013. [4] Kothari & Nagrath, "*Power System Engineering*", Tata Mc.Graw hill, 2nd Edition 2008.
E-resources and other digital material		[1] https://nptel.ac.in/courses/108105104/ [2] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-061-introduction-to-electric-power-systems-spring-2011/

17EE3502– Operational Amplifiers and Linear Integrated Circuits

Course Category:	Programme Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-1-0
Prerequisites:	Electronic Circuits-(17EE3302) Network Theory-I(17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	**Understand** the concepts of op-amps and its applications.
	CO2	**Design** different non-linear op-amp circuits and waveform generators.
	CO3	**Design** active filters, DACs and ADCs
	CO4	**Design** of timer circuits, PLL and voltage regulators.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO 1	PS O2
	CO1	**L**	**M**		**H**										**M**
	CO2		**H**		**H**										**M**
	CO3		**M**		**H**										**M**
	CO4	**L**	**M**												**M**

Course Content

UNIT I: **[Text Book -1&2]**

Operational amplifiers: Integrated circuits-types, classification, package types and temperature ranges, power supplies; operational-amplifier block diagram, ideal and practical operational-amplifier Specifications, 741 operational-amplifier features and specifications. Operational-amplifier characteristics-DC and AC characteristics.

Linear applications of operational amplifiers: Negative feedback concept in operational-amplifiers, inverting and non-inverting amplifier, voltage follower, differential amplifier, summing amplifier, instrumentation amplifier, V-I, I-V converters, integrator and differentiator.

UNIT II: **[Text Book - 1&2]**

Non Linear applications of operational amplifiers: Sample and hold circuit, log and antilog amplifiers, precision diode, applications- precision rectifier, peak value detector, clipper and clamper circuit.

Comparators and waveform generators: Introduction to comparator, basic comparator, applications-zero-crossing detector, window detector, voltage limiters; waveform generators- oscillators, Schmitt trigger, square-wave generator, triangular wave generator, saw tooth wave generator.

UNIT III: **[Text Book – 1 & 2]**

Active filters: Active low pass and high pass filters, Sallen key low pass

	and high pass filters, band pass filters – wide band pass and multiple feedback band pass filters, band stop filters-wide band stop and notch filter, all pass filters. **D/A and A/D converters:** Introduction, basic digital to analog converter techniques -weighted resistor digital to analog converter, R-2R ladder D/A converter; A/D conversion–parallel comparator type analog to digital converter, tracking type A/D converters, successive approximation analog to digital converter and dual slope analog to digital converter, digital to analog converter and analog to digital converter specifications. **UNIT IV: [Text Book - 1&2]** **Applications of special ICS:** 555 Timer- 555 as mono-stable and astable multi-vibrator and applications; voltage controlled oscillator; phase locked loops- operating principles, monolithic PLLs, 565 PLL applications; IC voltage regulators, 723 IC voltage regulator.
Text books and Referenc e books	**Text books** [1] Roy and Chowdhary, "*Linear Integrated Circuits*" New Age International Latest Edition. [2] Rama Kant A. Gayakwad, "*Operational amplifiers and Linear Integrated Circuits*", Prentice Hall India Pvt. Ltd. Latest Edition. **Reference Books** [1] Jacob, "*Applications and Design with Analog Integrated Circuits*", Prentice Hall India Pvt. Ltd. Latest Edition. [2] Denton J Dailey, "*Operational Amplifiers and Linear Integrated Circuits: Theory and Applications*", McGraw Hill Ltd, latest Edition.
E-resources and other digital material	1. https://nptel.ac.in/courses/117101106/

17EE3503– Microcontrollers

Course Category:	**Programme core**	**Credits:**	4
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3- 1 - 0
Prerequisites:	Digital Circuits and Systems (17EE3305)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Illustrate** the concept of embedded systems and architecture of 8051 microcontroller.
	CO2	**Composition** of different features on 8051 microcontroller.
	CO3	**Illustrate** the architecture and programming of AVR microcontroller.
	CO4	**Interfacing** of basic I/O devices.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1			**M**						**H**		**H**			**M**
CO2		**M**	**M**		**L**				**M**		**M**			**M**
CO3			**M**						**H**		**H**			**M**
CO4	**L**	**H**	**H**		**H**				**H**		**H**	**H**		**H**

Course Content

UNIT I: **[Text Book - 1&2]**

Introduction to Embedded Technology: Introduction to microprocessors and microcontrollers, differences between microprocessor & microcontrollers, types of microcontrollers based on architecture.

8051 Microcontroller Hardware: Features of 8051, block and pin diagram of 8051 controller, register organization, memory organization, addressing modes.

UNIT II: **[Text Book- 1&2]**

8051 On-chip Peripherals Interfacing [Using Embedded C]:

Timers-Register configuration, modes of operation, programming in mode1 and mode2.

Serial port (UART): Types of serial communications, Register configuration, modes of operation, programming in mode1.

Interrupts: Register configuration, programming of external hardware interrupts, timer and serial communication interrupts, interrupt priority and programming.

UNIT III: **[Text Book - 3]**

AVR Microcontrollers [ATMEGA328P]: Introduction, features of microcontroller, pin-diagram and block-diagram of ATMEGA328P controller, register organization, memory organization.

Introduction to ATMEGA328P Programming using generic development board: Introduction to embedded C, basic I/O instructions, loop instructions, conditional jump instructions.

UNIT – IV **[Text Book –2& 3]**

		External Peripherals Interfacing [using Embedded C]: Interfacing of Pushbutton, 4X4Hex-keyboard, general purpose LED, seven segment LED, 16X2 LCD, relay using both 8051 and ATMEGA328P development board, ADC808, DAC800 programming using 8051.
Text books and Reference books		**Text Book:** [1] Ayala, Kenneth J., '*The 8051 Microcontroller: Architecture, Programming and Applications*', West Publishing Company ,2007 [2] M. A. Mazidi, J. G.Mazidi, R.D. McKinlay, '*The 8051 Microcontroller and Embedded Systems using Assembly and C*', Pearson Education, 2nd Edition. [3] Richard.H.Barnett, sarah Cox,LarryO'Cull, "Embedded C Programming and the Atmel AVR" Delmar Cenage Learning, 2nd Edition. **Reference Books:** [1] Subrata Ghoshal, '*8051 Microcontroller: Internals, Instructions, Programming and Interfacing*', Pearson Education,2010. [2] A.V.Deshmukh, "*Microcontrollers Theory and Applications*", Tata McGraw Hill,2005 [3] Kenneth Ayala, Kenneth J. Ayala," *The 8086 Microprocessor: Programming and Interfacing the PC",* West Publishing Company ,1995.
E-resources and other digital material		[1] www.8052.com under tutorial section [2] Data sheet of ATMEGA328P : " http://ww1.microchip.com/downloads/en/DeviceDoc/ATmega48A-PA-88A-PA-168A-PA-328-P-DS-DS40002061A.pdf [3] https://www.avr-tutorials.com/

17EE2504A– Electrical Materials

Course Category:	**Open Elective-I (General Elective)**	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3- 0 - 0
Prerequisites:	Engineering Physics (17PH1202)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the basic structure of materials.
	CO2	**Analyze** the properties of conductors & semi conductors
	CO3	**Analyze** the behaviour of dielectrics & insulators
	CO4	**Analyze** the properties of magnetic materials

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**M**				**L**		**M**			**L**			**M**	
CO2	**M**				**L**		**M**			**M**			**M**	
CO3	**H**				**L**		**M**			**M**			**M**	
CO4	**M**				**L**		**M**			**M**			**M**	

Course Content

UNIT I: **[Text Book -1 &2]**

Introduction to Engineering Materials: Historical perspective of materials, classification of materials, properties of materials, bases of properties of materials, selection of materials.

Crystal structure of materials: Atomic model-Thomson's plum pudding model, Rutherford's nuclear model, Bohr's atomic model, important terms, concept of atom, electron configuration of atoms, crystal structure, bonds in solids.

UNIT II: **[Text Book – 1 &2]**

Conductors: Conductor, electric circuit, general properties of conductors, electrical conductors, specific resistance, factors affecting resistivity, temperature coefficient of resistance, variation of resistivity with temperature, electrical conducting materials, materials of low resistivity, high resistivity, materials for lamp filaments and transmission lines, stranded conductors, bimetals, carbon and graphite brushes, fuses, skin effect, proximity effect.

Semiconductors: Definition, characteristics, atomic structure, intrinsic and extrinsic semiconductors, atomic binding in semiconductors, formation of holes, Fermi level in an intrinsic semiconductor, electron conductivity of metal, current carriers in semi conductors, p-n junction diode, preparation of semiconductor materials, production of p-type and n-type crystals, transistors, electrical characteristics of semiconductors.

UNIT III: **[Text Book – 1 & 2]**

Dielectrics: Introduction, dielectric as an electric field medium, leakage currents, dielectric losses, break down voltage and dielectric strength, break down voltage in solid dielectrics, flashover and arc resistance, liquid dielectrics, gases as dielectrics, polarisation, electrical conductivity - solid dielectrics, liquid dielectrics and gaseous dielectrics, applications.

Insulators: Introduction, characteristics of good insulating materials,

		classification of insulating materials-solid insulating materials, liquid insulating materials, insulating gases, properties of insulating materials, air spaces in insulation, effect of moisture on insulation. **UNIT IV: [Text Book – 1 & 2]** **Magnetic materials:** Introduction,terms connected with magnetic materials, magnetic parameters, classification of magnetic materials, ferromagnetism, magnetic domains, magnetisation, properties of ferromagnetic materials, magnetic anisotropy, magnetostriction, para-magnetism, diamagnetism, magnetically soft and hard materials B-H curves, description of magnetic materials, feebly magnetic materials, cast and cermet permanent magnets, ageing of permanent magnets, effect of temperature, effect of impurities and alloying elements on electro magnet materials, losses in magnetic materials, factors affecting permeability and hysteresis loss.
Text books and Reference books		**Text Book:** [1] R.K.Rajput,"*A Course in Electrical Engineering Materials*", University Science Press, 1st Edition 2010. [2] Dr. C.S.Indulkar, Dr. S.Thiruvengadam, " *An Introduction to Electrical Engineering Materials*", S.Chand Publishers, 6th Edition., 2011. **Reference Books:** [1] A.J.Dekker,"*Electrical Engineering Materials*", Prentice Hall India Pvt. Ltd., Latest Edition.
E-resources and other digital material		https://nptel.ac.in/courses/122102008/

17EE2504B-Waste to Energy Conversion Technology

Course Category:	**Open Elective-I (General Elective)**	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3- 0- 0
Prerequisites:	Environmental Studies (17HS1407A)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Explore** the usage of municipal solid waste , bio-medical waste and environmental aspects.
	CO2	**Illustrate** the process for disposal of waste.
	CO3	**Explore** the process of energy conversion from thermo-chemical waste.
	CO4	**Explore** the process of energy conversion from bio-chemical waste

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**M**							**H**		**M**	**M**		**L**	
CO2	**M**							**H**		**M**			**L**	
CO3	**M**		**M**		**M**			**H**		**M**	**M**		**L**	
CO4	**L**		**M**					**H**		**M**			**L**	

Course Content

UNIT I: **[Text Book - 1]**

Introduction to Waste & Waste processing - Definitions, sources, types and composition of various types of wastes; Characterization of Municipal Solid Waste (MSW)-Industrial waste and Biomedical waste, waste collection and transportation; Waste processing-size reduction, separation; waste management hierarchy, waste minimization and recycling of MSW..

Environmental and health impacts-case studies: Environmental and health impacts of waste to energy conversion, case studies of commercial waste to energy plants, waste to energy- potentials and constraints in India, eco-technological alternatives for waste to energy conversions - Rules related to the handling, treatment and disposal of MSW and BMW in India.

UNIT II: **[Text Book -1]**

Waste Treatment and disposal: Aerobic composting, incineration, different type of incineration; medical and pharmaceutical waste incinerations- land fill classification, types, methods and silting consideration, composition, characteristics, generation, movement and control of landfill leachate and gases, environmental monitoring system for land fill gases. (**Case study).**

UNIT III: **[Text Book -1]**

Energy from waste-thermo chemical conversion: Sources of energy generation, incineration, pyrolysis, gasification of waste using gasifiers,

		briquetting, utilization and advantages of briquetting - environmental and health impacts of incineration; strategies for reducing environmental impacts. (**Case study).** **UNIT IV: [Text Book -2]** **Energy from waste- Bio-chemical Conversion:** Anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, industrial waste, agro residues, anaerobic digestion biogas production, land fill gas generation and utilization.(**Case study)** **Note: Case studies not to be included for main examination**
Text books and Reference books		**Text Book:** [1] Nicholas P Cheremisinoff, " Handbook Of Solid Waste Management And Waste Minimization Technologies", An Imprint of Elsevier, new Delhi 2003. [2] Paul Breeze, "Energy From Waste", An Imprint of Elsevier, new Delhi 2018. **Reference Books:** [1] C.Parker and T.Roberts (Ed.), " Energy from Waste", An Evaluation of Conversion Technologies, Elsevier Applied Science,London,1985. [2] Shah, Kanti L, "*Basics of Solid and Hazardous Waste Management Technology*", Prentice Hall, 2000. [3] Manoj Datta, "*Waste Disposal in Engineered Landfills*" by, Narosa Publishing House, Latest Edition
E-resources and other digital material		https://nptel.ac.in/courses/103107125/ https://swayam.gov.in/course/3562-waste-to-energy-conversion

17EE2505A– Fundamentals of Power Systems

Course Category:	**Open Elective-II (Inter Disciplinary Elective)**	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3- 0-0
Prerequisites:	Basic Electrical Engineering (17EE1104/17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the concepts of basics of electrical energy system.
	CO2	**Understand** the concepts of generation.
	CO3	**Understand** the concepts of Transmission and Distribution.
	CO4	**Understand** the concepts of switchgear and protection.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2
CO1						**L**		**L**					**L**	**L**
CO2	**M**		**M**			**L**		**L**					**M**	
CO3	**M**		**L**		**M**	**L**		**L**					**M**	**L**
CO4						**L**		**M**						

Course Content

UNIT I: **[Text Book - 1]**

Introduction to Power System Concepts: Fundamental concepts of DC and AC circuits, concept of phase difference, phase representation of alternating quantities, comparison of A.C. and D.C. systems, comparison of single phase and three phase systems, introduction to insulation materials and dielectrics calculation (simple problems), scenario of power systems in India-concept of regional and national grid.

UNIT II: **[Text Book-1]**

Generation: Conventional and Non-conventional sources of energy. different types of conventional power stations (elementary treatment). non-conventional sources of power generation types, merits and demerits of conventional and non-conventional sources of energy, concept of load estimation (simple calculation).

UNIT III: **[Text Book- 2]**

Transmission System (Short and Medium): Selection of voltage, Electrical features of transmission line-A.C. Transmission lines (Two- port Network Model - T and Π models), efficiency and regulation, corona (definition only).

Distribution system: Layout of H.T. and L.T. distribution system. comparison of overhead and underground distribution system, domestic and commercial tariff concepts.

UNIT IV: **[Text Book- 2]**

Switchgear and Protection: Circuit breakers, types, ratings, comparison, protection-fuses, relays, types & characteristics, comparison, protection schemes of generators, transformers, bus bars, feeders (elementary treatment),difference between power and instrument transformers (C.Ts, P.Ts).

Text books and Reference books		**Text Book:** [1] E El-Hawary, *"Introduction to Electrical Power Systems"*, John Wiley& Sons publication, IEEE, 2008. [2] V.K Mehta, Rohit Mehta, *"Principles of Power Systems"*, S.Chand publication. **Reference Books:** [1] Alexandra von Meier,"*Electric Power Systems: A Conceptual Introduction*",Wiley Survival Guides in Engineering and Science, Wiley-IEEE Press, 2006.
E-resources and other digital material		https://nptel.ac.in/courses/108102047/ https://nptel.ac.in/courses/108105058/

17EE2505B -Renewable Energy Systems

Course Category:	**Open Elective-II (Inter Disciplinary Elective)**	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0–0
Prerequisites:	Basic Electrical Engineering (17EE1104/17EE1204)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the basics of various renewable energy systems.
	CO2	**Understand** the concepts of solar energy and wind energy.
	CO3	**Understand** the concepts of bio-energy.
	CO4	**Understand** the concepts OTEC, tidal, geothermal and hydro.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**M**		**M**					**M**		**M**			**M**	
CO2	**M**		**M**					**M**		**M**	**L**		**M**	**L**
CO3	**M**		**M**					**M**		**M**			**M**	
CO4	**M**		**M**					**M**		**M**			**M**	**L**

Course Content

UNIT I: **[Text Book-1]**

Introduction: Introduction to energy sources, reserves and estimates, global energy scenario, renewable energy -environment implications, global warming and climate change, limitations of conventional energy sources, classification of non-conventional energy sources - solar energy, wind energy, bio-energy, *Ocean Thermal Energy Conversion* (OTEC), tidal, geothermal and hydro.

UNIT II: **[Text Book-2&3]**

Solar energy and Applications: Solar energy and its application, availability of solar radiation energy, collection and solar thermal storage, photovoltaic (PV) and solar thermal power generation, solar photovoltaic applications.

Wind energy: Wind energy and its application, types of wind mills and their characteristics, elementary design principles, wind energy conversation system, determination of torque coefficient, wind energy storage -applications -hybrid (wind & solar)systems.

UNIT III: **[Text Book-4]**

Bio-energy: Biomass and its sources, energy plantation, production of fuel wood, bio-conversion processes, bio-gas, bio-diesel and ethanol production and utilization, thermo-chemical processes, biomass gasification, process, types of reactors, utilization of producer gas for thermal and electricity generation.

UNIT IV: **[Text Book-1]**

***Ocean thermal energy conversion*, tidal, geothermal and hydro:** Tidal energy, wave energy, data, technology options; open and closed *Ocean thermal energy conversion* cycles, small hydro turbines, geothermal energy sources, power plant and environmental issues.

	Alternative energy sources: Hydrogen generation-storage, transport and utilization, applications, power generation. Fuel cells-Technologies, types, economics and power generation.
Text books and Reference books	**Text Book:** [1] G.D. Rai, "*Non Conventional Energy Sources*", Khanna Publishers, New Delhi, latest Edition, [2] Duffie, J.A. and Beckman, W.A., "*Solar Engineering of Thermal Process*",John Wiley 3rd Edition, 2013 [3] Lysen, E.H.A., "*Introduction to Wind Energy*", Franklin Institute Press. [4] *Y. W. B. Charles*, *B.H. Essel*, "*Biomass Conversion and Technology*", John Wiley, Latest Edition **Reference Books:** [1] Godfrey Boyle, "*Renewable Energy- Power for a Sustainable Future*", Oxford University Press, U.K., [2] Twidell, J.W. & Weir, A., "*Renewable Energy Sources*", E.F.N Spon Ltd., UK. [3] G.N. Tiwari, "*Solar Energy-Fundamentals Design, Modeling and Applications*", Narosa Publishing House, New Delhi, 2002. [4] L.L. Freris, "*Wind Energy Conversion systems*", Prentice Hall, UK.
E-Resources and other digital material	https://www.renewableenergyworld.com/index/tech.html https://nptel.ac.in/courses/121106014/ http://web.mit.edu/renewable-iap09 https://www.coursera.org/courses?query=renewable%20energy

17EE2506A - Illumination Engineering

Course Category:	**Open Elective –III (Self Learning Elective)**	**Credits:**	2
Course Type:	Theory	**Lecture - Tutorial - Practice:**	0 - 0 – 0
Prerequisites:	Engineering Physics (17PH1202)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the principles of illumination.
	CO2	**Analyze** the performance of various light sources.
	CO3	**Apply** the knowledge of illumination to the design of interior and exterior lighting.
	CO4	**Apply** the knowledge about the measurements and protections.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	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	H	L	L		H			L	M				M	
CO2	H	L	L		H			L	M				M	
CO3	H	L	L		H			L	M				M	
CO4	H	L	L		H			L	M				M	L

Course Content

UNIT I: **[Text Book-1]**

Introduction: Radiation, colour, eye and vision, different entities of illuminating systems, light sources, day light, incandescent, electric discharge, fluorescent, arc lamps and lasers.

UNIT II: **[Text Book-1]**

Illumination sources: Luminaries, wiring switching and control circuits, law of illumination, illumination from point, line and surface sources, photometry and spectrophotometry, photocells, environment and glare, general illumination and design.

UNIT III: **[Text Book-2]**

Lighting applications: Interior lighting- industrial, residential, office departmental stores, indoor stadium, theatre and hospitals Exterior lighting-flood, street, aviation and transport lighting, lighting for displays and signalling - neon signs, light emitting diode, liquid crystal diode displays, beacons and lighting for surveillance.

UNIT IV: **[Text Book-3]**

Measurement and Protections: Utility services for large building/office complex and layout of different meters and protection units, different type of loads and their individual protection, selection of cable/wire sizes, potential sources of fire hazards and precautions, emergency supply-standby and un-interrupted power supply, specific design problem on this aspect.

Text books and Reference books	**Text Book:** [1] Joseph B. Murdoch, "*Illumination Engineering from Edison's Lamp to the Laser*", Visions Comm, Latest Edition. [2] Ronald N. helms, M. Clay Beicher, "*Lighting for Energy efficient Luminous Environments*", Prentice Hall, Latest Eition. [3] Jack L. Lindsey, " *Applied illumination Engineering*" The Fairmont Press Inc., Latest Edition **ReferenceBooks:** [1] Marc Schiler, " *Simplified Design of Building Lighting*" John Wiley and Sons, 1992. [2] *IES Lighting Handbook*, 8th Edition, 1993
E-resources and other digital material	[1] http://www.nptel.ac.in Prof N.K.Kishore, " Illumination Engineering (web Course)", IIT Kharagpur.

17EE2506B–Introduction to Soft Computing

Course Category:	**Open Elective -III (Self Learning Elective)**	**Credits:**	2
Course Type:	Theory	**Lecture - Tutorial - Practice:**	0- 0 - 0
Prerequisites:	Linear Algebra and Calculus	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:												
	CO1	**Learn about** the basic concepts of Fuzzy logic.												
	CO2	**Learn about** the basic concepts of Genetic Algorithm.												
	CO3	**Learn about** the basic concepts of Evolutionary computing.												
	CO4	**Learn about** the basic concepts of Artificial Neural Networks.												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
	CO1	M				H				L		M		M	M
	CO2	M				H				L		M		M	M
	CO3	M				H				L		M		M	M
	CO4	M				H				L		M		M	M
Course Content		**UNIT I:** **[Text Book-1]** **Introduction to soft computing:** Introduction to fuzzy logic, Fuzzy membership functions and defining Membership functions, Fuzzy operations, Fuzzy relations Fuzzy implications, interferences, De-fuzzification techniques-I & II, Fuzzy logic controller-I &II. **UNIT II:** **[Text Book-2]** **Genetic Algorithm:** Concept Genetic Algorithm, Genetic Algorithm Operators: Encoding, Selection, cross over techniques, mutation and others **UNIT III:** **[Text Book-3]** **Evolutionary computing:** Introduction to Evolutionary computing-I**,** Introduction to Evolutionary computing-II, Multi Objective Evolutionary Algorithm (MOEA) Approaches: Non-Pareto, Pareto-I, Pareto-II. **UNIT IV:** **[Text Book-4]** **Artificial Neural Networks:** Introduction to Artificial Neural Networks, ANN Architecture, ANN Training-I, ANN Training-II, ANN Training-III, Applications of ANN operation.												
Text books and Reference books		**Text Book:** [1] Timothy J. Ross," *Fuzzy Logic with Engineering Applications", John Wiley* , Latest Edition [2] Melanic Mitchell, "*An Introduction to Genetic Algorithm*", MIT Press, Latest Edition. [3] Collelo, Lament, Veldhnizer, "*Evolutionary Algorithm for*												

		Solving Multi-objective, Optimization Problems", Springer, 2nd Edition. [4] Simon Haykin, "Neural Networks and Learning Machines", Prentice Hall of India (PHI). **Reference Books:** [1] D. K. Chaturvedi,"Introduction to Soft Computing-Techniques and its Applications in Electrical Engineering", Springer link
E-resources and other digital material		[1] https://nptel.ac.in/courses/106105173/26

17TP1507 – Personality Development

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Learning by doing	**Lecture–Tutorial-Practice:**	0- 0 - 2
Prerequisites:	Course title/course code	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the corporate etiquette.
	CO2	**Make** presentations effectively with appropriate body language
	CO3	**Composed** with positive attitude
	CO4	**Understand** the core competencies to succeed in professional and personal life

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								M		H				
CO2									M	H				
CO3										H				
CO4									M	H				

Course Content

UNIT I

Analytical Thinking & Listening Skills: Self-Introduction, shaping young minds - A Talk by AzimPremji (Listening Activity), self – analysis, developing positive attitude, perception.

Communication Skills: Verbal communication; non-verbal communication (Body Language).

UNIT II

Self-Management Skills: Anger Management, stress management, time management, six thinking hats, team building, leadership qualities.

Etiquette: Social etiquette, business etiquette, telephone etiquette, dining etiquette.

UNIT III

Standard Operation methods: Note making, note taking, minutes preparation, e-mail& letter Writing.

Verbal ability: Synonyms, antonyms, one word substitutes-correction of sentences-analogies, spotting errors, sentence completion, course of action-sentences assumptions, sentence arguments, reading comprehension, practice work.

UNIT IV

Job-Oriented Skills-I: Group discussion, mock group discussions.

		Job-oriented skills–II: Resume preparation, interview skills, mock interviews.
Text books and Reference books		**Text Book:** [1] Barun K. Mitra, "*Personality Development and Soft Skills*", Oxford University Press, 1st Edition,2011. [2] Meenakshi Raman &Sangeeta Sharma, "*Technical Communication*", Oxford University Press, 2nd Edition, 2011. **Reference Books:** [1] S.P. Dhanavel, "English and Soft Skills", Orient Blackswan, 2010. [2] R.S.Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S.Chand& Company Ltd., 2018. [3] Dr.ShaliniVerma, "*Body Language*", S.Chand Publishers, 1st Edition, 2013
E-resources and other digital material		[1] www.Indiabix.com [2] www.freshersworld.com

17EE3551-Microcontrollers Lab

Course Category:	**Programme core**	**Credits:**	1.5
Course Type:	Practice	**Lecture - Tutorial - Practice:**	0-0-3
Prerequisites:	Microcontrollers 17EE3503	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes	Upon successful completion of the course, the student will be able to:													
	CO1	**Design** and conduct experiment												
	CO2	**Evaluate** and **Analyze** experimental results												
	CO3	**Exhibit** professional behaviour												
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1		**M**		**H**										**H**
	CO2				**H**			**H**							**H**
	CO3				**H**			**M**							**H**

Course Content

Part A: Basic programming

1. Basic programs for understanding data transfers.
2. Basic programs for understanding arithmetic operations.
3. Basic programs for understanding conditional jump instructions.

Part B: Interfacing of Basic I/O using Arduino :

1. Generic LED interfacing with different duty cycle blinking
2. Interfacing of push button for reset and on/off operation.
3. Two digit Seven Segment LED interfacing for loop timer for 99sec.
4. Interfacing of 16X2 LCD for displaying messages.
5. Interfacing of 4X4Hex keypad.
6. Interfacing of Temperature sensor using LM35 and 16X2 LCD.
7. Design of Password based relay.
8. Interfacing of STEPPER motor

Part C: Hardware Interfacing with 8051:

9. Generic LED interfacing with different duty cycle blinking
10. Interfacing of push button for reset and on/off operation.
11. Two digit Seven Segment LED interfacing for loop timer for 99sec.
12. Interfacing of 16X2 LCD for displaying messages.
13. Interfacing of 4X4 Hex keypad.
14. Interfacing of Temperature sensor using LM35.
15. Serial communication with PC.
16. Interfacing of STEPPER motor using interrupts.

NOTE: A minimum of **Five form Part B and Five form Part C** to be conducted with a total of **Ten** experiments. .

17EE3552 –Electronic Circuits Lab-II

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Practice	**Lecture - Tutorial - Practice:**	0 - 0- 3
Prerequisites:	-	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Design** and conduct experiment
CO2	**Evaluate** and **Analyze** experimental results
CO3	**Exhibit** professional behaviour

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**M**	**M**		**H**										**M**
CO2	**M**			**H**	**M**		**M**							
CO3	**M**			**H**			**M**							

Course Content

List of Experiments

1. Measurement of op-amp parameters
2. Applications of op-amp -adder, subtractor, comparator
3. Realization of integrator & differentiator using op-amp
4. Realization of instrumentation amplifier using op-amp
5. Waveform generation using op-amp (square, triangular)
6. Design of clipper and clamper circuits using op-amp
7. Wein-bridge oscillator using op-amp
8. Design of active filters using op-amp (LPF & HPF-first order)
9. IC 555 timer monostable operation circuit
10. IC 555 timer astable operation circuit
11. Schmitt trigger using IC 555 timer
12. IC 565 PLL applications
13. Three terminal voltage regulators IC 7805 & IC 7905
14. Design of IC regulator using 723
15. D/A converter(R-2R ladder)

Note: - Realizing all the above experiments using different types of ICs

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

SCHEME OF INSTRUCTION FOR FOUR YEAR UG PROGRAMME [VR17]

Semester VI **Contact Hours: 28**

S.No	Course Code	Course	L	T	P	Credits
1.	17EE3601	Power Systems - II	3	0	2	4
2.	17EE3602	Power Electronics	3	1	0	4
3.	17EE4603	**Program Elective-1** **A.** Advanced Control Systems B. Digital control Systems C. Programmable Logic Controller	3	0	0	3
4.	17HS1604	Engineering Economics and Finance	2	0	0	2
5.	17EE2605	Open Elective-IV	3	0	0	3
	17EE2605A	Industrial Electrical System				
	17EE2605B	Electrical Energy conservation and Audit				
6.	17TP1606	Quantitative Aptitude	0	0	2	1
7.	17EE3651	Power Electronics Lab	0	0	3	1.5
8.	17EE3652	Digital signal Processing Lab	0	0	3	1.5
9.	17EE5653	Engineering Project for community services*	0	1	2	2
Total			**14**	**2**	**12**	**22**
10.	17MC1607	Biology for Engineers	2	0	0	---

17EE3601 - Power Systems-II

Course Category:	**Programme core**	**Credits:**	4
Course Type:	Theory	**Lecture –Tutorial- Practice:**	3-0-2
Prerequisites:	Power System-I(17EE3501)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Design** insulators and underground cables.
	CO2	**Illustrate** the working principle of basic protective relays.
	CO3	**Explain** the working principle of Static and Microprocessor based protective relays.
	CO4	**Analyze** the concepts of protection and different circuit breakers.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**M**				**H**			**M**					**H**	
CO2	**H**	**H**	**M**		**M**			**L**					**M**	
CO3	**M**	**H**	**M**		**M**			**L**					**M**	
CO4	**H**	**H**	**M**		**M**			**M**					**H**	

Course Content

UNIT I: **[Text Book - 1]**

Mechanical Design and Insulators: Mechanical design- calculation of supports at different levels-effect of ice, wind pressure, stringing charts. Types of insulators-Potential distribution over a string of suspension insulators- methods of increasing string efficiency.

Underground Cables: Types of cables, Insulation resistance-electric stress and capacitance of single core cable-use of inter sheath-capacitance grading-capacitance of three core belted type cable.

UNIT II: **[Text Book - 1]**

Electromagnetic Relays: Introduction, basic requirement of protective relaying, types of protection, classification of relays, electromagnetic relays-induction, non-directional over current or earth-leakage (Induction type) relays, directional relay(over current or earth fault relay), universal torque equation-distance relays- Impedance, admittance (MHO) and reactance relays, differential relays.

UNIT III: **[Text Book – 1& 2]**

Static Relays: Introduction, comparison of static relays with electromagnetic relays, different static relays-static over-current relays, static time over-current relays, Static instantaneous over-current relay.

Microprocessor Based Relays: Advantages and Disadvantages – block diagram for over Current (Definite, Inverse and IDMT) and distance Relays and their Flow Charts.

UNIT IV: **[Text Book - 1]**

Generation of Over-voltages: Mechanism of lightning-Lightning stroke-Over voltages due to lightning-Protection against lightning-Protection against travelling waves.

		Power System Grounding: Ungrounded neutral system-Grounded neutral system. **Circuit Breakers**: Introduction, Arc phenomena –terminology of circuit breakers, Resistance switching, Classification of circuit breaker - Impulse type circuit breaker, low oil circuit breaker, air blast -SF_6 Circuit breaker-Vacuum interrupters, testing of circuit breakers.
Text books and Reference books		**Text Book:** [1] M.L.Soni, P.V.Gupta, U. S. Bhatnagar and A. Chakraborti,"*Power System Engineering*", DhanpatRai& co. Pvt. Ltd., 2016. [2] Badri Ram, D.N Viswakarma,"*Power System Protection and Switchgear*",TataMc.Graw Hill, 4th Edition., 2011. **Reference Books:** [1] Sunil S Rao, "*Switchgear and Protection*", Khanna Publishers, Latest Edition. [2] C.L.Wadhwa, "*Electrical Power Systems*", New Age international (P) Ltd, 2012.
E-resources and other digital material		[1] https://nptel.ac.in/courses/108102047/18 [2] https://nptel.ac.in/courses/108108116/ [3] https://nptel.ac.in/downloads/108101039/

17EE3602- Power Electronics

Course Category:	**Programme core**	**Credits:**	4
Course Type:	Theory	**Lecture –Tutorial-Practice:**	3-1-0
Prerequisites:	Electronic Circuits(17EE3302), Network Analysis-I(17EE1204), Network Analysis-I(17EE3303).)	**Continuous Evaluation:** **Semester endEvaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the theory of various power electronic devices.
	CO2	**Analyze** the operation of AC and DC converters.
	CO3	**Elucidate** the operation of various DC and AC choppers.
	CO4	**Analyze** the operation of various inverters**.**

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	P S O 2
	CO1	**M**	**M**			**M**						**M**			**M**
	CO2	**M**	**H**		**H**	**H**						**M**			**H**
	CO3	**M**	**H**		**H**	**H**						**M**			**H**
	CO4	**M**	**H**		**H**	**H**						**M**			**H**

Course Content

UNIT I: **[Text Book - 1]**

Power semiconductor& switching devices: Power electronic devices-Introduction, characteristics of ideal switch, real switch, V-I characteristics of power diodes, Silicon Controlled Rectifier (SCR), Metal Oxide Semiconductor Field Effect Transistor(MOSFET) and Insulated Gate Bipolar Transistor (IGBT), two transistor model of SCR, turn ON methods of SCR, turn OFF methods of SCR (voltage commutation), snubber protection for SCR, quadrant operation of power semiconductor devices, GATE drive circuits for MOSFET/IGBT.

UNIT II: **[Text Book – 1]**

AC to DC converters: Introduction, single phase fully controlled bridge rectifier with R, pure inductor, RL and RLE loads-effect of source inductance performance parameters of converters.

Three Phase Converters: Three phase uncontrolled and fully controlled bridge converters with R, RL loads-performance parameters of converters.

UNIT III: **[Text Book - 1]**

AC to AC Regulators: Introduction-single phase two SCRs in anti-parallel– with R and RL loads–derivation of RMS load voltage, current and power factor.

DC to DC converters: Introduction, Chopper classification, time ratio control, buck converter, boost converter, buck-boost converters – Voltage and Current ripple calculations and design of L & C for all converters.

UNIT IV: **[Text Book - 1]**

		DC to AC converters: Introduction, single phase full bridge inverters, comparison between VSI & CSI, three phase VSI (180 &120 degree conduction modes). **Voltage control techniques for inverters:** Pulse-width modulation techniques - single pulse, multi-pulse, sinusoidal pulse width modulation techniques.
Text books and Reference books		**Text Book:** [1] P.S.Bhimbra, "*Power Electronics Circuits, Devices and Applications*", Khanna Publications., 5th Edition 2011. **Reference Books:** [1] NedMohan, Tore M.Undeland,William P.Robbins, "*Power Electronics Converters Applications and Design",* Wiley Publications, 3rd Edition. [2] Ramnarayana, "*Course Material on Switched Mode Power Conversion*", IISc. Bangalore. [3] M. H. Rashid,"*Power Electronics: Circuits Devices and Applications*", Pearson, 4th Edition [4] M.D.Singh, K.B.Kanchandani "Power Electronics" McGraw Hill Publications , 2nd Edition
E-resources and other digital material		[1]. www.nptel.ac.in/courses/108101038/

17EE4603A – Advanced Control Systems

Course Category:	**Programme Elective-I**	**Credits:**	3
Course Type:	Theory	**Lecture –Tutorial- Practice:**	3 - 0 - 0
Prerequisites:	Linear Control Systems (174EE3401) Matrices and Differential Calculus (17MA1101)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Design** of compensators using time and frequency domain
	CO2	**Design** control systems using state feedback.
	CO3	**Analyze** nonlinear control systems using describing functions
	CO4	**Determine** the stability of nonlinear systems using Lyapunov's method

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**H**		**H**	**M**	**M**									**L**
CO2	**H**				**M**									
CO3	**H**				**M**									
CO4	**M**			**M**	**M**							**M**		

Course Content

UNIT I: **[Text Book No:1]**

Compensation Techniques: Introduction, types of compensators, selection of compensator, realization of basic compensators-design of lead lag compensator**.**

Unit-II

State Feedback Controllers and Observers: State Space Representation, Solution of State Equation, State Transition Matrix, Controllable Canonical form, observable canonical form, Jordan canonical form, controllability and observability. Effect of state feedback on controllability and observability, Design of state feedback control through pole placement. Full order observer and reduced order observer.

UNIT III: **[Text Book No:1]**

Nonlinear Systems: Introduction to nonlinear systems, types of nonlinearities, describing functions, describing function analysis of nonlinear control systems, singular points, introduction to phase-plane analysis, method of isoclines for constructing trajectories.

UNIT IV: **[Text Book No:1]**

Lyapunov's Stability Theory: Stability in the sense of Lyapunov, Lyapunov's stability and instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems, Krasovskii's method.

Text books and Reference books		**Text Book:** [1] I.J.Nagrath & M.Gopal, " Control Systems Engineering ", New Age Int.(P), 5th , Edition, 2007. **Reference Books:** [1] K.Ogata, " Modern Control engineering ", PHI, 5th ,Edition [2] M.Gopal, "Modern Control System Theory", New Age, 3rd ,Edition
E-resources and other digital material		https://nptel.ac.in/courses/108103007/

17EE4603B–Digital Control System

Course Category:	**Program Elective –I**	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0–0
Prerequisites:	Digital Signal Processing (17EE3404) Linear Control Systems (174EE3401)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Formulate** digital control system.
	CO2	**Analyze** state variable techniques
	CO3	**Analyze** observability, controllability and stability
	CO4	**Design** digital Control Systems

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**H**													
CO2	**H**		**M**											
CO3	**H**				**M**									
CO4	**H**				**M**									**L**

Course Content

UNIT I: **[Text Book-1& 2]**

Introduction to discrete time control system, zero order hold-sampling theorems, Pulse transfer function–general procedures for Obtaining pulse transfer functions z-domain equivalent to s-domain–correlation between time response and root location in the z-plane–effect of pole-zero configuration in z-plane–transient response of sampled data systems–steady state error.

UNIT II: **[Text Book-1& 2]**

State Variable Technique: State equations of discrete time systems–solution of state equation-state transition matrix, its Properties –state space realization and state diagram–pulse transfer function from state equation characteristic equation-Eigen values –Eigenvectors, similarity transformation.

UNIT III: **[Text Book-1 &2]**

Controllability, Observability and Stability: Controllability and observability of linear Time Invariant (LTI) discrete data systems–tests for controllability and observability-relationship between controllability, observability and pulse Transfer functions, Stability of LTI discrete time systems-Jury's stability tests.

UNIT IV: **[Text Book-1&2]**

Controller Design: Transform of digital control systems–design specifications–bilinear transformation and State feedback-Design via pole placement–observer based state feedback–full and reduced order observers.

Text books and Reference books	**Text Book:** [1] K. Ogata , "*Discrete time control systems*", Pearson Education, 2nd Edition, 2003. [2] Gene F. Franklin, J. David Powell, Michael L. Work man, "Digital Control of Dynamic systems ", Pearson Education, 3rd Edition, 2002. **Reference Books:** [1] Benjamin C. Kuo, "Digital Control systems ", Oxford University,2nd Edition, 1997. [2] M. Gopal,"Digital Control and state variable methods",Tata McGraw hill, New Delhi, 2003.
E-resources and other digital material	https://nptel.ac.in/courses/108103008/

17EE4603C–Programmable Logic Controller

Course Category:	**Program Elective -I**	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 0 – 0
Prerequisites:	Microcontrollers(17EE3503)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the PLC internal architecture and ladder logic concepts.
	CO2	**Apply** the concept of register, timer, counter, and other intermediate
	CO3	**Control** the robots using PLC.
	CO4	**Extend** knowledge of PLC in analog operations.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**H**	**M**	**L**	**L**	**H**				**M**	**H**	**H**			**H**
CO2	**H**	**M**	**M**	**H**	**H**				**M**	**H**	**H**			**H**
CO3	**H**	**M**	**M**	**H**	**H**				**M**	**H**	**H**	**L**		**H**
CO4	**H**	**M**	**M**	**H**	**H**				**M**	**H**	**H**			**H**

Course Content

UNIT I: [Text Book-1& 2]

PLC Basics: PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

PLC Programming: PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT II: [Text Book-1& 2]

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers PLC Functions Timer functions and industrial applications counters counter function industrial applications. Architecture functions, Number comparison functions, number conversion functions.

UNIT III: [Text Book-1 &2]

Data Handling Functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT IV: [Text Book-1&2]

Analog PLC Operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples. PID principles

	position indicator with PID control, PID modules, PID tuning, PID functions. **Case Studies**: Different applications of Push buttons, Working of different types of Timers, Working of different types of Counters, Sequential operation of ON/OFF of a set of lights, Latching and Unlatching of a Motor, Automatic indication of water tank level,Traffic lights indication.
Text books and Reference books	**Text Book:** [1] John W Webb and Ronald A Reiss, "*Programmable Logic Controllers: Principle and Applications*", Printice Hall of India,5th Edition. [2] JR Hackworth and ED Hackworth, "Programmable Logic Controllers: Programming Method and Applications", Prentice Hall, 2004. **ReferenceBooks:** [1] Max Rabiee," *Programmable Logic Controllers: Hardware and Programming*", Goodheart-Willcox Publisher
E-resources and other digital material	https://nptel.ac.in/courses/112102011/11

17HS1604 - Engineering Economics and Finance

Course Category:	Institutional Core	**Credits:**	2
Course Type:	Theory	**Lecture - Tutorial - Practice:**	2 - 0 - 0
Prerequisites:	-	**Continuous Evaluation:**	30M
		Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** various forms of organizations and principles of management.
	CO2	**Understand** the various aspects of business economics.
	CO3	**Acquire** the knowledge on human resources and marketing functions.
	CO4	**Understand** best alternatives for various investment decisions and different depreciation methods.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	M											M		
CO2	M				H							M		
CO3	M											M		
CO4	M				H							M		

Course Content

UNIT I: **[Text Book-1&2]**

Forms of Business Organization: salient features of sole proprietorship, partnership, joint stock company, private limited and public limited companies, co-operative society and public sector.

Management: Introduction to management, management an art or science, functions of management, principles of scientific management, Henri Fayol's principles of management.

UNIT II: **[Text Book-1&2]**

Introduction to Economics: Introduction to basic economic concepts, utility analysis, marginal utility and total utility, law of diminishing marginal utility, law of equi-marginal utility, demand analysis: theory of demand, demand function, factors influencing demand, demand schedule and demand curve, shift in demand, elasticity of demand, elastic and inelastic demand, types of elasticity, factors of production, production function, production with one variable input, isoquants, returns to scale, cost function: cost-output relationship in short run and long run, relationship between AC and MC. Supply analysis, supply schedule and supply curve, factors influencing supply, supply function, theory of firm: price determination under equilibrium of firm, perfect competition.

National Income, Money and Banking, Economic Environment: National income concepts , GNP , NNP , methods of measuring national income , inflation , deflation, kinds of money , value of money , functions of bank , types of bank , economic liberalization, privatization , globalization.

UNIT III: **[Text Book – 1&2]**

Human Resource Management: Meaning and difference between personnel management and human resource management, functions of

		human resource management, recruitment and selection process. **Marketing Management:** Concept of selling and marketing, differences, functions ofmarketing, product life cycle, concept of advertising, sales promotion, types of distribution channels, marketing research, break, even analysis , problems. **UNIT IV: [Text Book- 1& 2]** **Financial management:** Functions of financial management, time value of money with cash flow diagrams, calculation of simple and compound interest, present worth, future worth, annual equivalent, methods of evaluating alternatives under present worth method, future worth method, annual equivalent method for choice of decision making among alternative projects. Depreciation, causes of depreciation, factors influencing depreciation, common methods of depreciation: straight line method, declining balance method, sum of year's digits method, problems.
Text books and Reference books		**Text Book:** [1] P.Prem chand Babu and M.Madan Mohan ***"****Managerial Economics and Financial Analysis",* Himalaya publishing house, 2011. [2] M. Mahajan "*Industrial Engineering and Production Management",* Dhanpat Rai Publications, 2nd Edition. **Reference Books:** [1] Theusen&Theusen, "*Engineering Economy*". [2] Philip Kotler&Gary Armstrong "*Principles of Marketing*", Pearson prentice Hall,New Delhi, 2012. [3] B.B Mahapatro, ***"****Human Resource Management****"***,New Age International,2011 [4] IM Pandey, "*Financial Management*" Vikas Publications 11th Edition R.Panneerselvam, ***"****Production and operations management****",*** PHI Learning Pvt Ltd, New Delhi, 2012
E-resources and other digital material		www.tectime.com www.exinfm.com www.slideshare.net www.economywatch.com

17EE2605A -Industrial Electrical Systems

Course Category:	**Open Elective - IV**	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial- Practice:**	3- 0 - 0
Prerequisites:	Power Systems-I (17EE3501)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** various components of industrial electrical systems.
	CO2	**Understand** the electrical wiring systems for residential, commercial and industrial consumers.
	CO3	**Analyze** and **Select** the proper size of various electrical system components.
	CO4	**Understand** the electrical systems automation.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	**H**	**H**	**H**		**H**								**M**	
CO2	**H**	**H**	**H**		**H**			**H**					**M**	
CO3	**H**	**H**	**H**		**H**			**H**					**H**	
CO4	**H**		**H**		**H**			**H**					**M**	

Course Content

UNIT I: **[Text Book - 1]**

Electrical system components: Low tension system wiring components, selection of cables, wires, switches, distribution box, metering system, tariff structure, protection components- fuse, Miniature Circuit Breaker (MCB), inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, isolator, relays, electric shock and electrical safety practices

UNIT II: **[Text Book -1]**

Residential and commercial electrical systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation.

UNIT III: **[Text Book -2]**

Industrial electrical systems: High tension connection, industrial substation, transformer selection, Industrial loads, motors, starting of motors, cable and switchgear selection, earthing design, type of compensation.

UNIT IV: **[Text Book -2]**

Industrial electrical system automation: Study of basic programmable logic controller, role of PLC in automation, advantages of process automation, programmable logic controller based control system design, panel metering and introduction to supervisory control and data acquisition (SCADA) system for distribution automation.

Text books and Reference books		**Text Book:** [1] S.L.Uppal and G.C. Garg, "*Electrical Wiring, Estimating & Costing*", Khanna publishers ,10th Edition, 2008. [2] K. B. Raina, "*Electrical Design, Estimating & Costing*", New age International, 2007 **Reference Books:** [1] Singh and R. D. Singh, "*Electrical estimating and costing*", DhanpatRai and Co. [2] H.Joshi, "*Residential Commercial and Industrial Systems*", McGraw Hill Education, 2008
E-resources and other digital material		https://www.electricaltechnology.org/2015/09/types-of-wiring-systems-electrical-wiring-methods.html https://www.electronicshub.org/electrical-systems-and-methods-of-electrical-wiring/

17EE2605B – Electrical Energy Conservation and Audit

Course Category:	Open Elective-IV	**Credits:**	3
Course Type:	Theory	**Lecture - Tutorial - Practice:**	3 - 0 – 0
Prerequisites:	Electrical Machines - I (17EE3303) Electrical Machines - II (17EE3403)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course, the student will be able to:
	CO1	**Understand** the concepts of energy audit, instruments
	CO2	**Analyze** depreciation methods and Energy efficient motor controls.
	CO3	**Analyze** energy efficient transformers and reactive power management.
	CO4	**Evaluate** the advantages of demand side management.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS01	PS O2
CO1	**M**			**M**	**H**	**L**					**L**		**L**	
CO2	**H**			**H**	**H**	**M**					**L**		**H**	
CO3	**H**			**H**	**H**	**M**					**L**		**H**	
CO4	**H**			**H**	**H**	**M**					**L**		**H**	

Course Content

UNIT I: **[Text Book – 1]**

Energy Audit: Definitions, need of concepts, types of energy audit, audit instruments, energy index, cost index, pie charts, sankey diagrams, System approach, end user approach to efficient use of electricity, energy auditing of a typical industrial/institutional unit - case study.

UNIT II: **[Text Book – 2]**

Energy Economics: Introduction, cost benefit, risk analysis, payback period, straight line depreciation, sinking fund depreciation, reducing balance depreciation, net present value method, internal rate of return method.

Energy Efficient motors: Energy efficient controls, methods to improve starting efficiency, load analysis and motor efficiency, load matching and selection of motors.

UNIT III: **[Text Book - 2]**

Energy efficient transformers: Introduction, transformer loading/efficiency analysis, case studies.

Reactive power management: Capacitor sizing, degree of compensation, capacitor losses, location-placement-maintenance, case studies, peak demand control methodologies, types of industrial loads, optimal load scheduling, case studies;

UNIT-IV: **[Text Book –1 & 2]**

Demand Side Management: Introduction, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation,

	energy efficient equipment.
Text books and Reference books	**Text Book(s):** [1] Wayne C.Turner, "*Energy management Hand book*", 8th Edition., John Wiley and son. [2] S.C. Tripathy, Electric "*Energy Utilization and Conservation*", Tata McGraw Hill, 1991. [3] Arry C. White, Philip S. Schmidt, David R. Brown, "*Industrial Energy Management Systems*", Hemisphere Publishing Corporation, New York, 1994. **Reference Books:** [1] John C. Andreas, "*Energy efficient electric motors selection and application*". [2] Amit kumarTyagi, "*Hand book on Energy Audit and Management*", TERI(Tata Energy Research Institute). [3] Paul W.O. Callaghan, "*Energy Management*", McGraw hill Book Company. [4] Rakosh Das Begamudre, "*Energy conversion systems*", Xth Ed., New Age International Publishers. [5] W.R.Murphy&G.Mckey Butterworths, "Energy Management", New Age International Publishers. [6] Kurose and Ross, "*Computer Networks- A Top-down Approach Featuring the Internet",* 'Pearson Education. [7] Economic Analysis of Demand Side Programs and Projects- California Standard Practice Manual, June 2002-Free download available online.
E-resources and other digital material	**BEE Reference book: no.1/3/4.** www.bee-india.com

17TP1606– Quantitative Aptitude

Course Category:	Institutional Core	Credits:	1
Course Type:	Learning by doing	Lecture - Tutorial - Practice:	0- 0 - 2
Prerequisites:	Course title/course code	Continuous Evaluation: Semester end Evaluation: Total Marks:	100M ---- 100M

Course outcomes		Upon successful completion of the course, the student will be able to:
	CO1	Solve basic mathematics problems.
	CO2	Apply strategies to simplify the problems.
	CO3	Apply mathematical skills in solving analytical problems personal life.
	CO4	Interpretation of data through graphs and charts.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M													
CO2		M												
CO3	M													
CO4				M										

Course Content

UNIT I:
Numerical ability l: Number system, HCF & LCM, average, simplification, problems on numbers.
Numerical ability II: Ratio & proportion, partnership, percentages, profit & loss.

UNIT II:
Arithmetical ability l: Problems on ages, time & work, pipes & cistern, chain rule.
Arithmetical abilityll: Time & distance, problems on boats &steams, problems on trains.

UNIT III:
Arithmetical ability lll: Allegation, simple interest and compound interest, races & games of skills, calendar and clock.
Logical ability: Permutations , combination and probability.

UNIT IV:
Mensuration: Geometry, areas, volumes,
Data interpretation: Tabulation, bar graphs, pie charts, line graphs

Text books and Reference books

Text Book:

[1] R. S. Aggarwal "Quantitative Aptitude", Revised., S Chand publication, 2017,ISBN:8121924987

E-resources and other digital material		

17EE3651– Power Electronics Lab

Course Category:	Program core	**Credits:**	1.5
Course Type:	Practical	**Lecture -Tutorial-Practice:**	0-0-3
Prerequisites:	Power Electronics(17EE3602) Electronic Circuits(17EE3302)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes		Upon successful completion of the course the student will be able to:
	CO1	**Design** and **conduc**t experiment.
	CO2	**Evaluate** and **Analyze** experimental results .
	CO3	**Exhibit** professional behaviour.

Contribution of Course Outcomes towards achievement of Program Outcomes (L–Low,M-Medium,H – High)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1		**M**		**H**			**M**							**M**
	CO2		**M**		**H**			**M**							**M**
	CO3						**M**								

CourseContent

LIST OFEXPERIMENTS

1. Static characteristics of SCR
2. Static characteristics of MOSFET &IGBT.
3. Gate/base drive circuits for MOSFET &IGBT
4. Single phase fully controlled rectifier
5. Single phase dual converter (circulating &non- circulating modes)
6. Three phase fully controlled rectifier.
7. Single phase AC voltage controller.
8. IGBT/MOSFET based H-bridge inverter.
9. Frequency control of single phase cyclo-converter (Centre tapped).
10. Step down/Step up MOSFET based chopper.

Additional Experiments

11. FPGA & DSP based control of single phase full bridge inverter
12. FPGA & DSP based control of buck converter.
13. FPGA & DSP based control of boost converter.
14. Three phase voltage source inverter

Minimum of 10 experiments

Task: Developing microcontrollers based gate drive circuits

17EE3652 – Digital Signal Processing Lab

Course Category:	**Programme core**	**Credits:**	1.5
Course Type:	Practice	**Lecture - Tutorial - Practice:**	0 - 0 – 3
Prerequisites:	Digital Signal Processing(17EE3404) Microcontrollers (17EE3503)	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30M 70M 100M

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	**Design** and **conduct** experiment.
	CO2	**Evaluate** and **Analyze** experimental results.
	CO3	**Exhibit** professional behaviour.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		**M**		**H**										**M**
CO2				**H**			**H**							**M**
CO3				**H**			**M**							

Course Content:

List of Experiments:

Part A: Programming

1. Evaluation of DFT of a 16 sample sequence using DIT algorithm.
2. Evaluation of IDFT of a 16 sample sequence using DIT algorithm
3. Evaluation of DFT of a 16 sample sequence using DIF algorithm
4. Evaluation of IDFT of a 16 sample sequence using DIF algorithm
5. Design of FIR filter using windowing methods
6. Design of digital Butterworth filter using bilinear transformation
7. Design of digital Chebyshev filter using bilinear transformation.
8. Design of digital Butterworth filter using impulse Invariance Transformation method
9. Design of digital Chebyshev filter using Impulse Invariance Transformation method
10. Digital filters using frequency transformation method

Part B: Digital Signal Processors:

1. Program to perform Linear convolution using CC Studio
2. Program to perform Circular convolution using CC Studio
3. Program to perform FFT operation using CC Studio
4. Program to perform Correlation using CC Studio
5. Implementation of FIR filters using Window Techniques
6. Sine Wave generation using lookup table output using DAC
7. Implementation of PI controller using Numerical methods
8. Design of Low Pass Filters

	NOTE: A minimum of five **from part 'A' and five from part 'B'** are to be conducted