I SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S239	English – I	4		3	25	75	100
2	S132	Applied Mathematics - I	4+1		3	25	75	100
3	S238	Engineering Physics	4+1		3	25	75	100
4	S146	Basic Engineering Mechanics	4+1		3	25	75	100
5	S170	Computer Programming	4+1		3	25	75	100
6	L142	Engineering Physics Lab.		3	2	25	50	75
7	L143	Engineering Workshop.		3	2	25	50	75
8	L126	Computer Programming Lab.		3	2	25	50	75
9	L123	Computer Aided Engineering Drawing		3	2	25	50	75
		Total			**23**	**225**	**575**	**800**

II SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S240	English – II	4		3	25	75	100
2	S133	Applied Mathematics – II	4+1		3	25	75	100
3	S232	Engineering Chemistry	4+1		3	25	75	100
4	S178	Data Structures	4+1		3	25	75	100
5	S209	Electrical Circuits – I	4+1		3	25	75	100
6	L144	English Communication Lab.		3	2	25	50	75
7	L140	Engineering Chemistry Lab.		3	2	25	50	75
8	L128	Data Structures Lab.		3	2	25	50	75
9	L114	Basic Simulation Lab.		3	2	25	50	75
		Total			**23**	**225**	**575**	**800**

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III SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S134	Applied Mathematics – III	4+1		3	25	75	100
2	S301	Measurement and Instrumentation	4+1		3	25	75	100
3	S216	Electrical Machines – I	4+1		3	25	75	100
4	S210	Electrical Circuits - II	4+1		3	25	75	100
5	S206	Electric and Magnetic Fields	4+1		3	25	75	100
6	S144	Basic Electronic Devices and Circuits	4+1		3	25	75	100
7	S355	Professional Ethics and Human Values	3			25	75	100
8	L112	Basic Electronics Lab		3	2	25	50	75
9	L134	Electrical Circuits and Measurements Lab		3	2	25	50	75
		Total			**22**	**225**	**625**	**850**

IV SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S164	Complex Variables and Statistical Methods	4+1		3	25	75	100
2	S174	Control Systems	4+1		3	25	75	100
3	S342	Power Generation and Utilization	4+1		3	25	75	100
4	S217	Electrical Machines - II	4+1		3	25	75	100
5	S127	Analog Electronics	4+1		3	25	75	100
6	S189	Digital Electronics Circuits	4+1		3	25	75	100
7	S243	Environmental Studies			--	25	75	100
8	L127	Control Systems Lab.		3	2	25	50	75
9	L136	Electrical Machines - I Lab.		3	2	25	50	75
		Total			**22**	**225**	**625**	**850**

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V SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S288	Linear and Digital IC Applications	4+1		3	25	75	100
2	S341	Power Electronics	4+1		3	25	75	100
3	S219	Electrical Power Transmission	4+1		3	25	75	100
4	S227	Elements of Signal Processing	4+1		3	25	75	100
5	S406	Thermal and Hydro Prime Movers	4+1		3	25	75	100
6	S169	Computer Organization	4+1		3	25	75	100
7	L137	Electrical Machines - II Lab.		3	2	25	50	75
8	L106	Analog and Digital Electronics Lab.		3	2	25	50	75
9	L176	Seminar			2	75	--	75
		Total			**24**	**275**	**550**	**825**

VI SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S213	Electrical Distribution Systems	4+1		3	25	75	100
2	S345	Power System Analysis	4+1		3	25	75	100
3	S313	Microprocessors and Microcontrollers	4+1		3	25	75	100
4	S429	Optimization Techniques in Engineering	4+1		3	25	75	100
5		**Program Elective-I**	4+1		3	25	75	100
	S105	Advanced Electrical Machines						
	S278	Intelligent Control Systems						
	S214	Electrical Engineering Materials						
	S104	Advanced Control Systems						
6		**Program Elective-II**	4+1		3	25	75	100
	S215	Electrical Machine Design						
	S161	Communication Principles and Systems						
	S199	Distributed Generation						
	S261	High Voltage Engineering						
7	L161	Microprocessors and Microcontroller Lab.		3	2	25	50	75
8	L169	Power Electronics Lab.		3	2	25	50	75
9	L164	Mini Project			2	25	50	75
		Total			**24**	**225**	**600**	**825**

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VII SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S270	Industrial Management	4+1		3	25	75	100
2	S346	Power System Operation and Control	4+1		3	25	75	100
3	S385	Solid State Drives	4+1		3	25	75	100
4	S347	Power System Protection	4+1		3	25	75	100
5		**Program Elective-III**	4+1		3	25	75	100
	S419	VLSI Design						
	S188	Digital Control Systems						
	S218	Electrical Power Quality						
	S379	Smart Grid						
6		**Open Elective-I**	4+1		3	25	75	100
	S168	Computer Networks						
	S295	Managerial Economics and Financial Analysis						
	S381	Software Engineering						
	S324	Object Oriented Programming through C++						
7	L119	Communication and Presentation Skills lab		3	2	25	50	75
8	L170	Power Systems Lab		3	2	25	50	75
9	L153	Internship			2	75	--	75
		Total			**24**	**275**	**550**	**825**

VIII SEMESTER

S. No.	Subject code	Name of the Subject	Contact hours/week		Credits	Scheme of Valuation		Total Marks
			L+T	P		Internal (CIE)	External (SEE)	
1	S230	Energy Conservation and Audit	4+1		3	25	75	100
2		**Program Elective-IV**	4+1		3	25	75	100
	S263	HVDC Transmission						
	S221	Electrical Tractions						
	S229	Embedded Systems Design						
	S248	FACTS Controllers						
3		**Open Elective-II**	4+1		3	25	75	100
	S196	Disaster Management						
	S373	Robotics and Automation						
	S357	Project Management						
	S180	Database Management Systems						
4	L157	Main Project		3	9	50	150	200
5	L121	Comprehensive Viva-voce			2	75	--	75
		Total			**20**	**200**	**375**	**575**

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I SEMESTER

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S239 - ENGLISH – I

Lecture	:	4 Periods / Week	Internal Marks	: 25
Tutorial	:		External Marks	: 75
Credits	:	3	External Examination	: 3 hrs.

UNIT – I

Astronomy (Learning English)
Grammar: Parts of Speech
Vocabulary: Antonyms
Analytical Writing: Unscrambling words in a sentence; Un-jumbling the sentences into a paragraph; Types of sentences; Paragraph writing.

UNIT – II

Travel and Transport (Learning English)
The Trailblazers - **Jagadis Chandra Bose** (Masterminds)
Grammar: prepositions; word plurals; sentence completion
Vocabulary: Synonyms
Analytical Writing: Drafting E-Mails; Letter writing (Formal & Informal)

UNIT - III

Humour (Learning English)
The Trailblazers – **Prafulla Chandra Ray** (Masterminds)
Grammar: Active & Passive Voices
Vocabulary: Pre-fixes & Suffixes
Analytical Writing: Note-making

UNIT - IV

Health and Medicine (Learning English)
The Trailblazers – **Srinivasa Ramanujam** (Masterminds)
Grammar: Tenses
Vocabulary: Deriving words
Analytical Writing: Abstract writing/Synopsis writing

UNIT - V

The World of Figures and Physics – **Chandra Sekhara Venkata Raman** (Masterminds)
Grammar: Articles
Vocabulary: One-Word substitutes
Analytical Writing: Essay writing; Dialogue writing (Formal & Informal)

TEXT BOOKS

1 "Learning English", Orient Longman Private Limited. 2008 JNTU edition
2 Enakshi Chatterjee, "Masterminds", Orient Longman Private Limited. 2002 (Reprint)

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REFERENCES

1. Andrea J Rutherford, "Basic Communication Skills for Technology", Pearson Education, New Delhi,1st edition, 2009
2. Murphy, "English Grammar with CD", Cambridge University Press, New Delhi, 2004
3. Rizvi & M. Ashraf, " Effective Technical Communication", Tata McGraw Hill, New Delhi,2008.
4. Blum Rosen, "Word Power", Cambridge University Press, New Delhi, 2009.

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S132 - APPLIED MATHEMATICS - I

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Differential Equations of First Order and First Degree
Differential equations of first order and first degree – Exact, Linear and Bernoulli. Applications to Orthogonal trajectories, applications to LCR circuits.

UNIT – II

Higher Order Differential Equations
Linear differential equations of second and higher order with constant coefficients and with variable coefficients, method of variation of parameters , Linear differential equations of second and higher order with variable coefficients – Cauchy's Equation and Legendre's Equations.

UNIT – III

Functions of Several variables
Generalized Mean Value Theorem(without proof), Maclaurin's series, Functions of several variables, Jacobians (polar, cylindrical, spherical coordinates), Functional dependence , , Maxima and Minima of functions of two variables with constraints and without constraints – Lagrangian Multiplier Method. Formation of Partial Differential Equations by the elimination of arbitrary constants and arbitrary functions. Solution of first order and first degree linear partial differential equation – Lagranze's method

UNIT –IV

System of Linear Equations.
Matrices - Rank- Echelon form, Normal form , PAQ form– Solution of Linear Systems – Homogeneous system of equations and Non Homogeneous System of Equations, Gauss Elimination, Gauss - Seidal and Jacobi Methods.

UNIT – V

Eigen Values and Eigen Vectors
Eigen values – Eigen Vectors – Properties – Cayley Hamilton Theorem – Inverse and Powers of a matrix by using Cayley Hamilton Theorem.

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TEXT BOOKS

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition,2012.
2. Dr. B. V. Ramana, "Higher Engineering Mathematics", TMGHPublications, 1st Edition,2010.

REFERENCES

1. M. D. Greenberg , "Advanced Engineering Mathematics", TMGH Publications, 2nd Edition,2011.
2. Erwin Krezig, "Advanced Engineering Mathematics", John Wiley & Sons , 8th Edition,2011.
3. W. E. Boyce and R. C. Diprima, " Elementary Differential equations", John Wiley & sons, 7th Edition,2001.

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S238 - ENGINEERING PHYSICS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTERFERENCE, DIFFRACTION, POLARIZATION

INTERFERENCE: Introduction, super position principle, coherent sources, thin films, Newton's rings (in reflected system only).

DIFFRACTION:

Introduction, Fresnel and Fraunhofer diffractions – comparsion between Fresnel's and fraunhofer's diffraction-Difference between interference and diffraction-Fraunhofer diffraction at single slit - Fraunhofer diffraction at Double slit –Diffraction Grating- Grating spectrum.

POLARIZATION:

Introduction-plane of vibration and plane of polarization -Polarization by reflection Brewster's law –geometry of calcite crystal- Double refraction -nicol prism construction ,Quarter wave plate- Half wave plate.

UNIT - II

PRINCIPLES OF QUANTUM MECHANICS:

De Broglie hypothesis- Matter waves- Davison and Germer experiment- GP Thomson experiment , Heisenberg Uncertainty principle-Schrodinger time independent wave equation-Physical significance of the wave function-particle in a box.

UNIT – III

LASERS AND FIBER OPTICS

LASERS:

Introduction – Characteristics of Lasers- Principle of laser (Absorption, Spontaneous and stimulated emission of Radiation), Population Inversion- Einstein Coefficients ,three and four level pumping schemes, block diagram of laser. Ruby Laser- Helium Neon Laser, Applications of Lasers.

FIBER OPTICS

Introduction- Principle of optical Fiber- Acceptance angle and Acceptance cone- Numerical aperture – Types of optical fibers-refractive index profile- Application of optical fibers.

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UNIT – IV

MAGNETIC MATERIALS:
Magnetic properties -Origin of magnetic moments-Classification of magnetic materials- Dia, Para, Ferro magnetic , Antiferromagnetic , Ferrimagnetic materials- Domain theory of ferromagnetism(qualitative), Hysteresis curve- Soft and Hard magnetic materials. Applications of magnetic materials.

UNIT – V

SUPER CONDUCTORS
Phenomenon, critical parameters, Meissner effect, Type-I, Type-II Super conductors, BCS theory of super conductivity,Flux Quantization,London Eqs., Penetration depth, Josephson Effects- Applications of Super conductors.

TEXT BOOKS

1. Engineering Physics by V RAJENDRAN Tata McGrahill
2. Engineering Physics by P K Palani Samy, Scitech Publications

REFERENCES

1. Engineering Physics by M R Srinivasan New age international,2014.
2. Engineering physics by M.N.Avadhanulu and P.G.Kshirsagar, S.Chand, New Delhi.
3. Engineering Physics RK GAUR & SL GUPTA, Dhanpat Rai Publication, 2008.
4. Basic Engineering Physics by Dr. P. Srinivasa Rao & Dr. K. Muralidhar, Himalaya Publishing House.

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S146 - BASIC ENGINEERING MECHANICS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction to Engineering Mechanics
Basic Concepts, **Resultant of System of Forces**: Resultant of Coplanar Concurrent Force System - Resultant of Coplanar Non-Concurrent Force System – Moment of a Force – Couple – Varignon's Theorem - Resultant of Force Systems, **Equilibrium of Systems of Forces**: Equilibrium of a Body Subjected to Concurrent Forces - Free Body Diagram - Lami's Theorem - Equilibrium of Connected Bodies

UNIT – II

Friction
Introduction - Types of Friction - Laws of Friction - Angle of Friction - Angle of Repose – Problems on blocks resting on horizontal and inclined planes

UNIT – III

Centroid
Use of axis of symmetry – Determination of Centroid of Triangle, Semicircle, Quarter circle, Sector of a circle, Parabolic segment from basic principles **Centre of Gravity:** Use of symmetry - Determination of Center of gravity of Simple Bodies (from basic principles) **Area Moment of Inertia:** Theorems of Moment of Inertia – Determination of Moment of Inertia of Circle, Rectangle, Hollow circle, Semi circle, Quarter of a circle, Triangle from basic principles.

UNIT – IV

Mass Moment of Inertia
Radius of gyration – Determination of Mass Moment of Inertia of Uniform Rod, Rectangular Plate, Circular Plate, Solid Cone, Solid Sphere and Solid Cylinder.

UNIT – V

Kinematics
Rectilinear Motion – Motion Curves – Motion with Constant Velocity – Motion with Constant Acceleration **Projectiles:** Definitions – Motion of a Body Projected Horizontally – Inclined projection on Level Ground

TEXT BOOKS

1. Engineering Mechanics, S.S. Bhavikatti, New Age International (P) Ltd.
2. Engineering Mechanics, N.H.Dubey, McGraw Hill

REFERENCES

1. Engineering Mechanics, B.Bhattacharya, Oxford University Press
2. Engineering Mechanics, A.K.Tayal, Umesh Publications
3. Engineering Mechanics, R.K.Bansal, Laxmi Publications
4. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins
5. Engineering Mechanics, Manoj K Harbola, Cengage Learning

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S170 - COMPUTER PROGRAMMING

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Algorithm / pseudo code, flowchart, example flow charts, structure of C program, identifiers, basic data types and sizes, Constants, variables, Input-output statements, A sample c program, operators: arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence of operators and order of evaluation. Conditional statements: if, ifelse, else if ladder and switch statements, continue, go to and labels. Loops: while, do-while and for statements, break, programming examples.

UNIT - II

Arrays- one dimensional arrays-concept, declaration, definition, accessing elements, storing elements, two dimensional and multi-dimensional arrays. **Character Strings:** declaration, initialization, reading, writing strings, arithmetic operations on characters, string handling functions programming examples

UNIT – III

Pointers- concepts, declaring &initialization of pointer variables, pointer expressions, address arithmetic, pointers and arrays, pointers and character strings, pointers to pointers,Pre-processor Directives and macros. **Functions:** basics, category of functions, parameter passing techniques, recursive functions, Functions with arrays, storage classes-extern, auto, and register, static, scope rules, Standard library functions., dynamic memory management functions, command line arguments, c program examples.

UNIT - IV

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, C program examples.

UNIT - V

Files – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling, C program examples.

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HEAD
Department of Computer Science and Engineering
Lakireddy Bali Reddy College of Engineering
MYLAVARAM, Krishna (Dist) - 521 230.

TEXT BOOKS

1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education.
2. C and Data Structures ,N.B.Venkateswarlu and E.V.Prasad.

REFERENCES

1. Programming in c –Reema Thareja, Oxford Publications.
2. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion
3. Programming in c—Pradeep Dey, Oxford Publications.

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HEAD
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MYLAVARAM, Krishna (Dist) - 521 230.

L142 - ENGINEERING PHYSICS LAB

Practical	:	3 Period / Week	Internal Marks	: 25
			External Marks	: 50
Credits	:	2	External Examination	: 3 hrs.

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1. Determine the Radius of Curvature of Plano - Convex lens by forming Newton's Rings.
2. Determine the Wavelengths of various spectral lines using grating with the normal incidence method.
3. Determination of wavelength of laser radiation.
4. Study the magnetic field along the axis of a current carrying coil and to verify Biot – Savart's law.
5. Determine the Refractive index of a given prism.
6. Determine the thickness of a thin material using wedge shaped film.
7. Determine the width of the slit by using laser source by forming diffraction pattern.
8. Determine the specific rotation of an optically active substance.
9. Study the characteristics of L.C.R Circuit.
10. Determine the frequency of AC supply by using Sonometer.
11. Determine the rigidity modulus of a given material using Torsional pendulum.
12. Determine the frequency of a vibrating bar or electrical tuning fork using Meldy's apparatus.

REFERENCES:

Lab Manual prepared by the LBRCE.

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L143 - ENGINEERING WORKSHOP

Practical	:	3 Period / Week	Internal Marks	: 25
			External Marks	: 50
Credits	:	2	External Examination	: 3 hrs.

At least **four trades** with **two exercises** from each trade:

1. Carpentry
2. Fitting
3. House – Wiring
4. Plumbing
5 Tin - Smithy
6. Black - Smithy

REFERENCE BOOK:

1. P. Kannaiah, K.L. Narayana, Workshop manual, Scitech Publications, India Pvt Ltd

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L126 - COMPUTER PROGRAMMING LAB

Practical	:	3 Period / Week	Internal Marks	: 25
			External Marks	: 50
Credits	:	2	External Examination	: 3 hrs.

Recommended Systems/Software Requirements:

- Intel based desktop PC, ANSI C Compiler with Supporting Editors, IDE's such as Turbo C.
- Linux with gcc compiler.

LIST OF LAB PROGRAMS:

I) write a programme in 'C' language to cover the following problems.

a) Example program which shows the usage of various preliminary Data types available in C Language.

b) Example program which shows the usage of various Operators available in C Language.

c) Example programs to illustrate the *order of evaluation*.

II) write example programs:

a) To check whether the given year is leap year (or) not.

b) Roots of Quadratic Equation.

c) Finding smallest& biggest number from the given set of 4 numbers using 'if' statement.

d) Calculate the student grade in the examination – assume suitable constraints.

e) Prepare electricity bill for the consumed units – assume suitable Constraints.

f) Converting given two digit number into words using switch statement

g) To illustrate the usage of 'goto' statement.

III) EXAMPLE PROGRAMS:

a) To Display first N natural numbers

b) To find whether the given number is Armstrong (or) not

c) To find reverse of the given number and to check whether it is palindrome (or) not.

d) To find whether given number is strong number (or) not.

e) To check whether given number is Prime (or) not

f) To display prime numbers with in the given range (Nesting of Loops).

g) To display the following structure (Nesting of Loops)

i)

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

ii)

```
5 4 3 2
4 3 2 1
3 2 1
2 1
1
```

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IV) Write example programs in C Language to perform following operations:

a) Finding the sum and average of given numbers using Arrays.
b) To display elements of array in reverse order
c) To search whether the given element is in the array (or) not using linear search & binary search.
d) Write a C program to perform the following operations
i) Addition, subtraction and multiplication of Matrices
ii) Transpose of given matrix
(The above operations are to be exercised using functions also by passing arguments)
e) Write a C program to find whether the given string is palindrome (or) not.
f) To accept line of text and find the number of characters, number of vowels and number of blank spaces in it.
g) Write an example program to illustrate the use of any 5 string handling functions.

V) a) Example program to bring clarity on pointer declaration & initialization and Pointer arithmetic.
b) Write an example program to describe the usage of *call by reference*.
c) Write a program to find sum of the elements of the array using functions.

VI) Write example programs in C Language:
a) To find factorial of a given number using functions.
b) Swap two numbers using functions.
c) To find GCD of two numbers using recursion
d) Write a recursive function to solve Towers of Honai problem.
e) Write an example program to illustrate use of external & static storage classes.
f) Write an example program to illustrate the usage of command line arguments.
g) Program to illustrate the usage of dynamic memory management functions.

VII) a) Write an example program using structures to process the student record. Assume suitable fields for student structures (Different kinds of initialization of structure variables are to be exercised)
b) Write a program to read records of 10 employees and find their average salary (exercise array of structures & Nested structures concepts through this program).
c) Write a program to handle a structure variable using pointers and implement self referential structure(i.e. A structure variable having a pointer to itself)

VIII) Write an example program on file to perform following operations:

a) Accessing content from files and writing content in to it.
(Exercise different file operation modes)
b) Copy the contents of one file into another (Exercise different file operation modes)

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L123 - COMPUTER AIDED ENGINEERING DRAWING LAB

Practical	:	3 Period / Week	Internal Marks	: 25
			External Marks	: 50
Credits	:	2	External Examination	: 3 hrs.

At least 10 Exercises are to be conducted using Auto Cad software:

BASIC AUTO CAD COMMANDS:

1. Basic drawing commands (line, circle, arc, ellipse, polygon, and rectangle).
2. Edit commands (copy, move, erase, zoom).
3. Array commands (polar array, rectangular array, P-edit, divide aline, offset).
4. Hatching &line commands (hatching with different angles& different types of lines).
5. Mirror & trim commands (mirror an object, trim, extend a line, chamfer &fillet, explode).
6. Dimensioning & text commands (linear, angular, radius, diameter& text).

PROJECTION OF POINTS AND LINES:

1. Projection of points (I, II, III, & IV quadrants).
2. Projection of lines parallel to both reference planes.
3. Projection of lines parallel to one reference plane & inclined to other reference plane.

ORTHOGRAPHIC PROJECTIONS:

1. Conversion of plane figures.
2. Conversion of circular figures.
3. Conversion of both combination of plane figures and circular figures.

ISOMETRIC PROJECTIONS:

4. Conversion of plane figures.
5. Conversion of circular figures.
6. Conversion of both combination of plane figures and circular figures.

REFERENCES:

1. M. Kulkarni, A.P Rastogi, and A.K. Sarkar, Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi, 2009.

2. Bethune, Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi, 2009.

3. N. D. Bhatt, Engineering Drawing, 51th Revised and Enlarged Edition, Charotar Publishers, 2012.

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CYCLE: 1

SNO	SHEETS	EXERCISE	COMMANDS TO BE COVERED	REFERENCES	PAGE NUMBER
1	SHEET-1	Basic drawing commands	line, circle, arc, ellipse, polygon, and rectangle	PLATE 2.1& 2.2	26
2	SHEET-2	Edit commands	copy, move, erase, zoom, measure, divide, pan, change properties	PLATE 2.3& 2.4	27
3	SHEET-3	Array commands	polar array, rectangular array, P-edit, divide aline, offset	PLATE 2.5& 2.6	28&29
4	SHEET-4	Hatching &line commands	hatching with different angles& different types of lines	PLATE 2.8& 2.9	31&32
5	SHEET-5	Mirror & trim commands	mirror an object, trim, extend a line, chamfer &fillet, explode	PLATE 2.7& 2.13	30&35
6	SHEET-6	Dimensioning & text commands	linear, angular, radius, diameter& text	PLATE 4.1	69
7	SHEET-7	Projection of points	Points & lines	Case-1,2,3,4	171
8	SHEET-8	Projection of lines(parallel to both reference planes)	line	Fig:9.4(a & b)	172&173
9	SHEET-9	Projection of lines (parallel to one reference plane & inclined to other reference plane)	lines	Fig:9.4(c)	173

CYCLE: 2

SNO	SHEETS	EXERCISES	REFERENCE	PAGE NUMBER
Orthographic projections				
10	SHEET-10	Conversion of plane figures	PLATE 5.1& 5.3	82&83
11	SHEET-11	Conversion of circular figures	PLATE 5.9& 5.13	86&88
12	SHEET-12	Conversion of both combination of plane figures and circular figures	PLATE 5.25,5.26 PLATE5.27,5.28	94&95
Isometric projections				
13	SHEET-13	Conversion of plane figures	PLATE 6.3	122
14	SHEET-14	Conversion of circular figures	PLATE 6.4	123
15	SHEET-15	Conversion of both combination of plane figures and circular figures	PLATE 6.8&6.10	125&126

Note: References and Page numbers have been given from below text book

M. Kulkarni, A.P Rastogi, and A.K. Sarkar, Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi, 2009.

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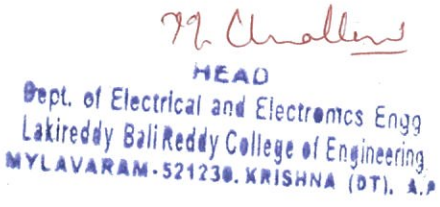
II SEMESTER


LBRCE
EXAMINATION SECTION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S240 - ENGLISH – II

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:		External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Environment (Learning English)
The World of Figures and Physics – **Satyendranath Bose** (Master Minds)
Grammar: Correction of sentences
Analytical Writing: Report Writing

UNIT - II

Inspiration (Learning English)
The Institution Builders– **Santi Swarup Bhatnagar** (Masterminds)
Grammar: If-clause; Question tags
Vocabulary: Idioms and Phrases
Analytical Writing: Resume'; Statement of Purpose

UNIT - III

Human Interest (Learning English)
The institution builders – **Meghanadh Saha** (Master Minds)
Grammar: Direct & Indirect Speeches
Vocabulary: Phrasal Verbs
Analytical Writing: Memo Drafting

UNIT – IV

Media (Learning English)
The New Age – **Homi Jehangir Bhabha** (Master Minds)
Grammar: Concord
Vocabulary: Analogy
Analytical Writing: Information Transfer/ Data Interpretation (Tables, Pie charts, Bar graphs, Tree diagrams, Pictograms, etc.)

UNIT – V

The New Age – **Vikram Sarabhai** (Master Minds)
Grammar: Gerunds & Infinitives; Correction of Sentences
Vocabulary: Words often confused
Analytical writing – Comprehension, Expansions (of a given topic/ proverbs)

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TEXT BOOKS

1. "Learning English", Orient Longman Private Limited.JNTU edition,2008
2. EnakshiChatterjee, "Masterminds", Orient Longman Private Limited ,Reprint-2002

REFERENCES

1. KoneruAruna, "Professional Communication", Tata McGraw-Hill, New Delhi, 2007.
2. Rizvi, "Effective Technical Communication", Tata McGraw-Hills, New Delhi, 2009.
3. Andrea J. Rutherford, "Basic Communication Skills for Technology", Pearson Education., 1st edition, 2009
4. Kaplan and Baron's, "GRE and TOEFL', Latest editions.2008

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S133 - APPLIED MATHEMATICS – II

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Laplace Transforms
Laplace transforms of standard functions –Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function. Inverse Laplace transforms– Convolution theorem - Applications of Laplace transforms to ordinary differential equations.

UNIT – II

Fourier Series
Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series

UNIT – III

Fourier Transforms
Fourier integral theorem (only statement) – Fourier sine and cosine integrals – Fouriertransform – sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT – IV

Z-Transforms
Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems - Inverse Z –transform - Convolution theorem – Solution of difference equation by z-transforms.

UNIT – V

Multiple Integrals
Multiple integrals - double and triple integrals (Cartesian, polar, spherical coordinates) – Changing of order of Integration and applications to areas and volumes.

TEXT BOOKS

1. Dr. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers,42nd Edition,2012.
2. Dr. B. V. Ramana, "Higher Engineering Mathematics", The McGraw Hill Companies, 1st Edition,2010.

REFERNCES

1. Michael D. Greenberg , "Advanced Engineering Mathematics",The McGraw Hill Companies, 2nd Edition,2011.
2. Erwin Krezig, "Advanced Engineering Mathematics", John Wiley & sons,8th Edition,2011.

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S232 - ENGINEERING CHEMISTRY

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

WATER TECHNOLOGY: Sources of water and quality. Hardness of Water - Temporary and Permanent hardness. Units and their interrelation. Problems on Temporary and Permanent hardness. Disadvantages of hard water in various industries.
Boiler troubles – scale & sludge formation, Caustic Embrittlement, boiler corrosion, priming & foaming (carryover).
Internal Treatment - Phosphate, Calgon, Carbonate, Sodium aluminate Conditioning of Water.
External Treatment - Lime-Soda Process, Zeolite process , Ion- Exchange Process merits and demerits. (Note-Problems on lime-soda process are not included)
Desalination of brackish water-Electrodialysis, reverse osmosis

UNIT - II

Fuel Technology: Definition and classification of Fuels, merits and demerits of solid liquid and gaseous fuels. Gross and net calorific values – (definition only).
Solid fuels- coal - analysis, Proximate and ultimate analyses of coal – significances.
Liquid Fuels – petroleum-origin and refining of petroleum- cracking- fixed bed and moving bed methods, synthetic petrol – Bergius and Fischer Tropsch's methods.
Working of I.C and C.I engines –Knocking in I.C and C.I engines, antiknocking agents Octane number , Cetane number(Definitions only)
Gaseous fuels- Natural gas, CNG Advantages of CNG, Flue gas analysis – Orsat's apparatus.

UNIT - III

CORROSION: Definition, Examples.
Dry Corrosion(Direct Chemical corrosion), Types of dry corrosion-oxidative corrosion, Pilling Bed worth rule, corrosion by other gases, liquid metal corrosion.
Wet Corrosion (Electro Chemical corrosion) Mechanism- Oxygen absorption Hydrogen evolution type, Types of wet corrosion, Galvanic Corrosion, passivity, Galvanic Series Concentration Cell Corrosion, intergranular corrosion, stress corrosion, Soil corrosion.
Factors Influencing Corrosion- Nature of metal and nature of environment.
Control of Corrosion - Proper Design, Use of pure metals and metal alloys, Cathodic Protection - Sacrificial anode and Impressed Current, Modifying the Environment and use of Inhibitors.

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UNIT - IV

Polymer Science and Technology: Definition, classification of polymers, Functionality, Types of polymerization-addition, condensation, copolymerization
Plastics preparation, properties and engineering applications of, PVC, Teflon, Bakelite ,PMMA.
Conducting polymers: Polyacetylene, Polyaniline, conduction, doping, application.
Rubbers Natural rubber and it's processing, disadvantages of Natural rubber , Vulcanization and significance.
Elastomers- preparation, properties and engineering applications of Buna S, Buna N, Thiokol.
Fibers- preparation, properties and engineering applications of Polyester, fiber reinforced plastics (FRP).

UNIT – V

(a) **Green chemistry**-Goals and significance of green chemistry. Basic components (alternative starting materials, reagents, reaction conditions, final products) of green chemistry research.
(b) **Liquid crystals** –Classification of liquid crystals (Thermo tropic, lyotropic) and applications.

TEXT BOOKS

1. Jain & Jain, A text book of Engineering Chemistry by DhanpatRai Publishing Company, New Delhi (15th Edition) (2006).
2. Dr. S.S Dara, Dr.S.S Umare A Text book of Engineering Chemistry by S.Chand Publications, 12th Edition, 2010.
3. ShashiChawla, A Text book of Engineering Chemistry by DhanpatRai Publishing Company, Third Edition, 2003.

REFERENCES

1. Dr. Y. Bharathi Kumari and Dr. JyotsnaCherukuri, A Text book of Engineering Chemistry by VGS Publications, First Edition, 2009
2. R.V. Gadag, A.Nityananda Shetty, I.K. International publishing house 1st edition 2006
3. Dr. M. R. Senapati, Advanced Engineering Chemistry by University Science Press (Impart from Laxmi Publications), 3rd Edition 2009.

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S178 - DATA STRUCTURES

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Algorithm Analysis:
Mathematical Background, Model, Analysis and Run Time Calculations, **Lists:** Abstract Data Types, List using arrays and pointers, Singly Linked, Doubly Linked, Circular Linked Lists, Polynomial ADT.

UNIT – II:

Stacks: The Stack: Definition, operations, implementation using arrays, linked list and **Stack applications:** Infix to postfix expression conversion, Evaluation of Postfix expressions, balancing the symbols.**Queue:** definition, operations, implementation using arrays, linked list&it'sApplications.**Circular queue**: definition&its operations, implementation, **De queue**: definition & its types, implementation.

UNIT - III

Searching: Linear and Binary Searching. **Sorting:** Insertion Sort, Selection sort, Shell Sort, Heap Sort, Merge Sort, Quick Sort, and Bucket Sort.

UNIT - IV

Trees: Terminology, **BinaryTrees:** definition, types of binary trees, Representation, Implementation (linked list), **Tree traversals**: Recursive techniques, Expression Tress, **Search Tree:** Binary Search Tree-search, insert, Delete, **Balanced Tree** –Introduction to AVL tree and Rotations.

UNIT - V

Graphs: Fundamentals, Representation of graphs,**Graph Traversals:** BFS, DFS, **Minimum cost spanning tree:** Definition, Prim's Algorithm, Kruskal's algorithm.
Hashing: Hash Table, Hash Function, Collison resolution Techniques- separate Chaining, open addressing, rehashing, extendible hashing.

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TEXT BOOKS

1. **Mark Allen Weiss,"Data Structures and Algorithm Analysis in C"**, 2nd edition, Pearson Education.
2. **ReemaThareja ,Data Structures using c** , Oxford Publications.
3. **C and Data Structures**-N.B.Venkateswarlu and E.V.Prasad.

REFERENCES

1. Langson, Augenstein&Tenenbaum, 'Data Structures using C and C++', 2nd ed, PHI.
2. RobertL.Kruse, Leung and Tando, 'Data Structures and Program Design in C', 2nd ed, PHI.
3. D Samantha ,Classic Data Structures

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LBRCE EXAMINATION SECTION

S209 - ELECTRICAL CIRCUITS - I

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

INTRODUCTION TO ELECTRICAL CIRCUITS

Circuit Elements–Linear and Non-Linear, Active and Passive, Unilateral and Bilateral, Lumped and Distributed, Independent and Dependent Sources, Voltage - Current relationship for passive bilateral elements (for different input signals-square, ramp, saw tooth, triangular)-Ohm's law, Krichhoff's laws, Source transformation. Network reduction techniques-Series, parallel, star-to-delta and delta-to-star transformation. Nodal analysis, mesh analysis, super node and super mesh analysis for D.C excitations.

UNIT - II

MAGNETIC CIRCUITS

Magnetic circuits-Basic terminology, Analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction-concept of self and mutual inductance-dot convention-coefficient of coupling-composite magnetic circuit-analysis of series and parallel magnetic circuits.

UNIT - III

SINGLE PHASE A.C CIRCUITS

Peak, R.M.S, average, instantaneous values, Form factor and Peak factor for different periodic wave forms – sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, Steady state analysis of R,L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-Concept of Reactance, Impedance, Susceptance and Admittance, Real , Reactive and apparent Power, Power Factor. Resonance-series, parallel circuits, concept of band width and Q factor .Locus diagrams – series and parallel (R-L, R-C combination).

UNIT - IV

NETWORK THEOREMS (WITHOUT PROOF)

Superposition, Thevenin, Norton, Maximum Power Transfer, Millman, Tellegen, Reciprocity and Compensation theorems for D.C and sinusoidal excitations.

UNIT - V

NETWORK TOPOLOGY

Definitions – Graph – Tree, Basic Cutset and Basic Tieset matrices for planar networks –Tree and Nodal analysis , Link and Loop Analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks

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TEXT BOOKS

1. William Hayt and Jack E.Kemmerley, "Engineering Circuit Analysis" ,Mc Graw Hill Company, 8th edition.
2. Robert L. Boylestad. "Introductory Circuit Analysis", Pearson Education, Canada.

REFERENCES

1. Van Valkenburg, "Network Analysis and Synthesis", Prentice-Hall of India Private Ltd
2. Chakrabarti A,"Electric Circuits Analysis & Synthesis " Dhanpat Rai & Co (p) Ltd,2002.
3. A. Sudhakar and Shyammohan S Palli, "Electrical Circuits" Tata McGraw- Hill.
4. N.C.Jagan, C.Lakshmi Narayana, "Network Analysis", BS publications 2nd edition.
5. Charles K Alexander, Mathew. N. O.Sadiku, "Fundamental of Electric Circuits", Tata McGraw- Hill ,3rd edition.

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L144 - ENGLISH COMMUNICATION LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

The following course content is prescribed for English Language Communication Skills Laboratory sessions:

1. Introduction to English Phonemes; Phonetic Transcription, Stress.
2. JAM
3. Role Play
4. Information Transfer
5. Group Discussions

SUGGESTED SOFTWARE

1. Digital Mentor: Globarena,Hyderabad,2005

2. Sky Pronunciation Suite: Young India Films, Chennai, 2009

3. Mastering English in Vocabulary, Grammar, Spelling, Composition, Dorling Kindersley,USA,2001

4. Dorling Kindersley Series of Grammar, Punctuation, Composition, USA, 2001

5. Oxford Talking Dictionary, The Learning Company, USA, 2002

6. Learning to Speak English - 4 CDs. The Learning Company,USA,2002

7. Cambridge Advanced Learners English Dictionary (CD). Cambridge University Press, New Delhi, 2008

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L140 - ENGINEERINIG CHEMISTRY LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

(Any 8 experiments)

Model experiment

1. Estimation of sodium hydroxide by using hydrochloric acid.

Water analysis

2. Determination of alkalinity of water sample
3. Determination of total Hardness of water by EDTA method
4. Determination of permanent hardness of water by EDTA method.
5. Determination of Dissolved Oxygen (D.O) content by Winkler's method

Preparation of polymers

6. Preparation of Urea formaldehyde resin.
7. Preparation of Phenol formaldehyde resin.

Redox titrations

8. Determination of amount of potassium dichromate in given solution by using sodium thiosulphate.
9. Determination of the amount of Oxalic acid and Sulphuric acid in 1 liter solution by Using given standard Sodium Hydroxide and Potassium Permanganate solution.
10. Estimation of Mohr's salt by using potassium permanganate.
11. Estimation of Mohr's salt by using potassium dichromate.
12. Estimation of Mohr's salt by using Oxalic acid.

Estimation of Vitamin content

13. Estimation of Vitamin-C

REFERENCES

Lab manual

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L128 - DATA STRUCTURES LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

LIST OF LAB PROGRAMS:

1. Write a C program to implement various operations on List using arrays.
2. Write a C program to implement various operations on Single linked List using pointers.
3. Write an interactive C program to create a linear linked list of customer names and their telephone numbers. The program should be menu-driven and include features for adding a new customer, deleting an existing customer and for displaying the list of all customers.
4. Write a C program to create a circular linked list so that the input order of data items is maintained. Add the following functions to carry out the following operations on circular single linked lists. a) Count the number of nodes. b) insert a node c) delete a node
5. Write a C program that will remove a specified node from a given doubly linked list and insert it at the end of the list on an existing list. Also write a function to display the contents of the list.
6. Write a C program to implement a stack using array &linked list in which Push, Pop and display can be performed.
7. Write a program to convert infix expression to post fix expressions using array implementation of stack
8. Write a program for evaluating post fix expressions using array implementation of stack
9. Write a C program to implement a queue using arrays and linked list in which insertions, deletions and display can be performed.
10. Write a C program to implement insertion sort& shell sort
11. Write a C program to implement Selection sort.
12. Write a C Program to implement Merge Sort
13. Sort a sequence of n integers using Quick sort technique and then search for a key in the sorted array using Binary search, linear search techniques.
14. Write a C program to Heap sort
15. Write a C program to construct a binary tree and do inorder, preorder and postorder traversals, printing the sequence of nodes visited in each case.
16. Write a C program to implement BST operations- insert, search and delete
17. Write a C program to implement the following graph Traversals

    a) BFS b)DFS

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L114 - BASIC SIMULATION LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

List of Experiments

Lab VIEW

1. Solving simple differential (1st and 2nd order) equations & formulae.
2. Verification of Ohm's & Kirchoff's laws for dc excitations
3. Analysis of Voltage and Current divider circuits.
4. Calculation of Equivalent resistance for Series and Parallel circuits.
5. Calculation of Equivalent resistance using star/delta transformations

MATLAB

6. Analysis of R, RL and RC circuits for dc and ac excitations
7. Plot the characteristics of impedance, reactance and current with frequency for series and parallel resonant circuits. Also calculate resonant frequency, BW and Q-factor.
8. Plot the current locus diagrams for series and parallel R-L, R-C circuits
9. Verification of Thevenin's & Norton's theorems.
10. Verification of the Maximum power transfer theorem.

MULTISIM

11. Solution of non-linear algebraic equation using Newton-Rapson method.
12. Verification of Superposition & Reciprocity theorems using PSPICE (with dependence and independence sources)

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III SEMESTER

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S134 - APPLIED MATHEMATICS – III

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Solution of Algebraic and Transcendental Equations and Numerical Integration
Solutions of Algebraic and Transcendental Equations – Regula False Position method and Newtons Raphson Method in one variable. Numerical Integration – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

UNIT – II

Interpolation and Finite Differences
Interpolation: Introduction – Finite differences- Forward Differences-Backward differences – Central differences – Symbolic relations and separation of symbols-Differences of a polynomial- Newton's formulae for interpolation – Lagrange's Interpolation formula.

UNIT – III

Numerical solution of Ordinary Differential Equations
Numerical solution of Ordinary Differential equations, Solution by Taylor's series - Picard's Method of successive Approximations - Euler's Method - Runge- Kutta Methods.

UNIT – IV

Vector Differentiation
Vector Differentiation: Gradient- Directional Derivatives -Divergence – Solenoidal fields- Curl –Irrotation fields-potential surfaces - Laplacian and second order operators and related properties of sums and products

UNIT – V

Vector Integration
Vector Integration - Line integral – work done –area - surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems.

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TEXT BOOKS

1. S. S. Sastry, "Introductory Methods of Numerical Analysis". Prentice Hall of India, 5th Edition,2005.
2. Dr. B. V. Ramana, "Higher Engineering Mathematics", The McGraw Hill Companies, 1st Edition,2010.

REFERNCES

1. Dr. B.S. Grewal , "Higher Engineering Mathematics", Khanna Publishers, 42ndEdition,2012.
2. Steven .C. Chopra and Ra. P. Canale, "Numerical Methods for Engineers with programming and software application", The McGraw Hill Companies, 4th Edition,2002.
3. M. K. Jain, S. R. K. Iyengar, R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers., 5th Edition,2007.

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S301 - MEASUREMENTS AND INSTRUMENTATION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

MEASURING INSTRUMENTS

Objective of measuring instruments, Accuracy, Precision And Uncertainty, error analysis Classification of measuring instruments, Essentials of indicating instruments: deflecting, controlling and damping systems. Construction, working, torque equation, various advantages and disadvantages of MI (attraction and repulsion), and PMMC. Ammeter and Voltmeter theory: Extension of range of ammeters and voltmeters using shunt, multiplier. Universal shunt, Universal multiplier.

UNIT – II

MEASUREMENT OF R, L, C

Measurement of Resistance:Voltmeter-ammeter method. Kelvin's Double Bridge, Measurement of earth resistance -Megger. A.C. Bridges: sources & detectors for A.C bridge, General equation for bridge at balance. Measurement of Inductance: Maxwell's Inductance – Capacitance Bridge, Andersons Bridge. Measurement of Capacitance: Schering Bridge.

UNIT – III

SPECIAL PURPOSE MEASURING INSTRUMENTS

Instrument Transformers: connection of CT & PT in the circuit, advantages of CT / PT over shunt and multipliers for range extension, transformation ratio, turns ratio, nominal ratio, burden etc, and ratio and phase angle error. Frequency meter(electrical resonance type). Potentiometers: Principle of D.C. Potentiometer (Crompton's type) & its applications

UNIT – IV

MEASUREMENT OF POWER,ENERGY AND POWER FACTOR

Wattmeter: Construction, working, torque equation, errors and their compensation in dynamometer type wattmeter, low power factor wattmeter, poly-phase wattmeter. Measurement of reactive power, determination of power factor of the load and its nature in terms of two wattmeter readings. Energy meter: Construction, working, torque equation, errors and adjustments of single phase conventional (induction type) energy meter. Three phase energy meter. Power factor meter(dynamometer type).Flux meter.

UNIT – V

INSTRUMENTATION

Transducers, classification of transducers, strain gauges, inductive transducers, LVDT, capacitive transducers, piezoelectric transducer, photo-voltaic & photo-conductive cells.

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TEXT BOOKS

1 Sawhaney, A Course in Electrical and Electronic measurements & Instrumentation – , Dhanpat Rai & Sons

2 E. W. Golding & widing, Electrical measurement & measuring instrument, Fifth edition, A. H. Wheeler & Co. ltd.

REFERENCES

1. Nakra & Chaudhari, Instrumentation: Measurement and Analysis, Tata McGraw Hill, New Delhi, Sixth Reprint

2. Ghosh Introduction to Electrical Measurements and instrumentation, PHI Publication, Second Edition

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S216 - ELECTRICAL MACHINES –I

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

D.C. GENERATORS

Construction & Principle of Operation of D.C. Generators –E.M.F Equation- Types of D.C Generators –Armature reaction –Methods of reducing the effects of armature reaction– Compensating winding-Commutation– Methods of improving commutation.– O.C.C-Voltage build up in generators-Critical field resistance and critical speed - Causes for failure to self excite and Remedial measures–Load characteristics of shunt, series and compound generators, losses in a dc machine-power stages-condition for maximum efficiency-problems.

UNIT – II

D.C MOTORS

Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation–Speed control-3 point and 4 point starters–Constant and Variable losses-calculation of efficiency – condition for maximum efficiency – Brake test – Swinburne's test –Hopkinson's test- Retardation Test.

UNIT – III

SINGLE PHASE TRANSFORMER

Types - constructional details-emf equation - operation on no load and on load - phasor diagrams– Equivalent circuit - losses and efficiency-regulation. All day efficiency-effect of frequency & supply voltage on core losses- minimization of hysteresis and eddy current losses

UNIT – IV

TESTING OF SINGLE PHASE TRANSFORMER

O.C and S.C tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses -Parallel operation with equal and unequal voltage ratios.

UNIT – V

AUTO TRANSFORMERS & POLY PHASE TRANSFORMERS

Auto transformers- comparison with two winding transformers-Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ - open Δ-Scott connection -three winding transformers-tertiary windings-off load and on load tap changing.

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TEXT BOOKS

1. P.S. Bimbra, "Electrical Machinery" , Khanna Publishers, 5th Edition, 1997
2. I.J.Nagrath & D.P.Kothari, "Electric Machines", Tata Mc Graw Hill, 7th Edition.2005

REFERENCES:

1. M.G. Say ,"Alternating Current Machines", John Wiley & Sons
2. A. E. Fitzgerald, C. Kingsley, S. Umans ,"Electric Machinery ", Tata Mc Graw Hill, 7th editon
3. Ashfaq Husain, "Electric Machines", Dhanapati Rai&Co, New Delhi, 2002 edition.

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S210 - ELECTRICAL CIRCUITS - II

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

THREE PHASE CIRCUITS

Three phase circuits: Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced three phase circuits-Calculation of Active and Reactive power in balanced Three phase systems. Analysis of three Phase unbalanced circuits-Loop Method- Millman's Theorem method- Star Delta Transformation Technique.

UNIT – II

TRANSIENT ANALYSIS

Initial conditions, Transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitation- Analysis using classical and Laplace transform methods.

UNIT – III

TWO PORT NETWORKS

Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations. Concept of transformed network – Two port network parameters using transformed variables-Cascaded networks.

UNIT – IV

FOURIER ANALYSIS OF A.C CIRCUITS

Fourier theorem- Trigonometric form and exponential form of Fourier series – conditions of symmetry- line spectra and phase angle spectra- Analysis of Electrical Circuits to Non sinusoidal periodic waveforms. Fourier Integrals and Fourier Transforms – properties of Fourier Transforms and Application to Electrical Circuits.

UNIT – V

NETWORK SYNTHESIS

Identification of network synthesis-, Brune's positive and real function (PRF), properties of PRF, testing of driving point functions, even and odd function, one terminal pair network driving point synthesis with LC elements, RC elements, RL elements Foster and Cauer form.

Filters- Filter fundamentals, High Pass, Low Pass, Band Pass and Band Reject filters (Qualitative Treatment Only)

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TEXT BOOKS

1. William Hayt and Jack E.Kemmerley, "Engineering Circuit Analysis" ,Mc Graw Hill Company,6 th edition
2. C.L.Wadhwa, "Network Analysis And Synthesis", New Age International publication.

REFERENCS

1. Van Valkenburg, "Network Analysis and Synthesis", Prentice-Hall of India Private Ltd
2. A. Sudhakar ,Shyammohan, S Palli, "Electrical Circuits" Tata McGraw- Hill.
3. N.C.Jagan, C.Lakshmi Narayana, "Network Analysis", BS publications 2nd edition.
4. Charles K Alexander, Mathew. N. O.Sadiku, "Fundamental of Electric Circuits", Tata McGraw- Hill ,3rd edition.
5. Chakrabarti A,"Electric Circuits Analysis & Synthesis " Dhanpat Rai & Co (p) Ltd,2002.

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III SEMESTER

S206 - ELECTRIC AND MAGNETIC FIELDS

(Common to EEE, EIE)

Pre Requisite: Applied Mathematics-II

Course Objective:

The objective of this course is to introduce the concepts of electric and magnetic fields and their applications which will be useful in the development of the theory for Electrical Machines and Power Systems.

Course Outcomes:

After completion of the course, students will able to:

CO1. State and explain the basic laws of electro magnetism and apply them to elementary problems

CO2. Understand the behaviour of electric and magnetic fields in the presence of magnetic and dielectric materials.

CO3. Describe the boundary conditions for magnetic and electric fields at dielectric interfaces.

CO4. Examine time varying fields for torque development

UNIT – I
ELECTRO STATICS

Introduction to Coordinate systems, Divergence and Strokes theorem, Electrostatic Fields-Coulomb's Law ,Electric Field, Electric Field Intensity (EFI) –Electric Fields due to continuous charge distributions-Volume charge, surface charge, line charge. EFI due to a line and a surface charge –Electric Flux, Electric Flux density, Gauss's law, Application of Guass's Law, Maxwell's first law. Work done in moving a point charge in an electrostatic field,– Electric Potential – Properties of potential function – Potential gradient, Electric dipole – Dipole moment , potential and EFI due to an electric dipole. Energy stored and energy density in a static electric field.

UNIT – II
CONDUCTORS, DIELECTRICS AND CAPACITANCE

Conductors -Current, Current density, Equation of continuity, Conduction Current, Ohm's law in point form, behaviour of conductors in an electric field. Dielectrics – polarization, Displacement and Convection current, Electric field inside a dielectric material, Conductor-Free space and Dielectric- Dielectric boundary conditions. Capacitance – Capacitance of parallel plate and spherical and co-axial capacitors with composite dielectrics. Laplace's and Poison's equations – Solution of Laplace's equation in one variable.

UNIT – III
MAGNETO STATICS

Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation. Ampere's circuital law and its applications- MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation.

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S144 - BASIC ELECTRONIC DEVICES AND CIRCUITS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

JUNCTION DIODE CHARACTERISTICS :

Review of semi conductor Physics – n and p –type semi conductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level of semiconductors, Energy band diagram of PN diode, PN diode-biasing, The current components, Diode equation, V-I characteristics, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Breakdown Mechanisms in p-n Diode, Zener diode, Tunnel Diode, Varactar Diode, LED, LCD. And photo diode.

UNIT – II

RECTIFIERS AND FILTERS :

Half wave rectifier, Full wave rectifier, Bridge rectifier , Ripple factor Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, Π- section filter, Multiple L- section and Multiple Πsection filter, and comparison of various filter circuits in terms of ripple factors, basics of regulators.

UNIT – III

TRANSISTOR and FET CHARACTERISTICS :

Junction transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Current components in a transistor, Input and Output characteristics of transistor in Common Base, Common Emitter, and Common collector configurations, Relation between Alpha,Beta and gama, Small signal model of Transistor,JFET, MOSFET characteristics (Enhancement and depletion mode), Comparison of Transistors, Introduction to SCR and UJT.

UNIT – IV

BIASING AND STABILISATION

BJT biasing, DC equivalent model, criteria for fixing operating point, Fixed bias, Collector to base bias, Self bias techniques for stabilization, Stabilization factors, (S, S', S"), Compensation techniques, (Compensation against variation in V_{BE}, I_{co},) Thermal run away, Thermal stability.FET Biasing.

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UNIT – V

AMPLIFIERS

Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of transistor configurations in terms of A_I , R_i , A_v , R_o , .FET Amplifier(CD and CS).

Oscillators-Introduction- Barkhausen Criterion, Classification of Oscillators, RC Oscillators-RC Phase shift Oscillator using FET, RC Phase shift Oscillator using BJT, Wein Bridge Oscillator. LC Oscillators- Hartley Oscillator, Colpitts Oscillator, Clapp Oscillator, Crystal Oscillator, Frequency and Amplitude Stability of Oscillators.

TEXT BOOKS

1. Jacob Millman, Christos C Halkias and Satyabrata Jit, Millman's Electronic Devices and Circuits, Tata McGraw Hill, Second Edition, New Delhi, 2008.
2. R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, Pearson/Prentice Hall,9th Edition,2006

REFERENCES

1. S Salivahanan, N.Suresh Kumar and A Vallavaraj, Electronic Devices and Circuits, McGraw Hill, 5th edition, 2010.
2. T.F. Bogart Jr., J.S.Beasley and G.Rico, Electronic Devices and Circuits, Pearson Education, 6th edition, 2004.

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S355 - PROFESSIONAL ETHICS AND HUMAN VALUES

Lecture	:	3 Periods / Week	Internal Marks	:	25
Tutorial	:	0 Period / Week	External Marks	:	75
Credits	:		External Examination	:	3 hrs.

UNIT - I

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 - Cooperation – Commitment – Empathy – Self Confidence – Character – Spirituality

UNIT – III

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - Engineering Projects VS. Standard Experiments - Engineers as responsible experimenters – Codes of ethics - Industrial Standards - A balanced outlook on law- The challenger case study.

UNIT - IV

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and risk- Assessment of safety and risk- Risk benefit analysis and reducing risk- Three Mile Island and Chernobyl case study - Collegiality and loyalty -Respect for authority - Collective bargaining – Confidentiality- Conflicts of interest - Occupational crime - Professional Rights- Employee rights- Intellectual Property Rights (IPR) discrimination.

UNIT - V

GLOBAL ISSUES

Multinational Corporation's -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).

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TEXT BOOKS

1. R.S.Nagarajan, a Textbook on "Professional Ethics and Human Values", New Age Publishers – 2006.
2. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.

REFERENCES

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey,2004 (Indian Reprint now available)
3. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available).
4. John R Boatright, "Ethics and the conduct of business", Pearson Education, New Delhi,2003.
5. Edmund G Seebauer and Robert L Barry, "Fundamentals of ethics for scientists and engineers", Oxford University Press, Oxford, 2001.

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L112 - BASIC ELECTRONICS LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

List of Experiments

1. Study the characteristics PN junction diode
2. Study the characteristics Zenar diode
3. Calculation of Ripple factor and regulation of Full wave rectifier with & without filters
4. Determination of h-parameters of transistor from CE characteristics
5. Determination of h-parameters of transistor from transistor CB characteristics
6. Determination of h-parameters of transistor from FET transfer characteristics
7. Calculation of parameters from FET characteristics
8. Calculation of Band width of CE Amplifier
9. Calculation of Band width of CC Amplifier
10. Study the characteristics SCR Characteristics

Additional Experiments

1. Calculation of Band width of Common Source FET Amplifier
2. Calculation of Band width of CD FET amplifier

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III SEMESTER

L134 - ELECTRICAL CIRCUITS AND MEASUREMENTS LAB

Pre Requisite: Electrical Circuits-I

Course Objective:

The objective of this lab is to provide the student with basic knowledge of measuring instruments and techniques with proficiency. These techniques are designed to complement the concepts introduced in Electrical Circuits-I&II, Electrical Measurements and Instrumentation. In addition, the student learns how to effectively record experimental result and present them in written form.

Course Outcomes:

At the end of the course Students will be able to

CO1. Analyze electrical circuits with AC and DC excitations experimentally
CO2. Determine two port network parameters
CO3. Measure Resistance, Inductance and Capacitance parameters using DC and AC bridges.
CO4. Calibrate the given energy meter.
CO5. Determine magnetic coupled coil parameters experimentally.

List of Experiments:

Electrical Circuits

1. Verification of Thevinen's and Norton's theorems.
2. Verification of Superposition and Maximum Power Transfer theorem (both AC and DC excitations).
3. Verification of Two port network parameters(Z and Y).
4. Calculation of Resonance frequency, Band Width, Quality factor for Series and Parallel resonant circuits.
5. Determination of self, Mutual Inductances and Coefficient of coupling for a coupled coil.

Measurement and Instrumentation

6. Measurements of unknown resistance, inductance, and capacitance using Bridges.
7. Measurement of Power by using two-wattmeter method and reactive power measurement using Single wattmeter method.
8. To plot the displacement –voltage characteristics of the given LVDT.
9. Measurement of power and power factor of a single phase inductive load and to study. effect of capacitance connected across the load on the power factor.
10. Calibration of single phase energy meter.

Additional Experiments

11. PSPICE simulation of Transient response of RL and RC circuits for DC Input.
12. Measurement of Earth Resistance by using Megger.

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IV SEMESTER

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S164 - COMPLEX VARIABLES AND STATISTICAL METHODS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

ANALYTIC FUNCTIONS AND COMPLEX INTEGRATION

Functions of a complex variable – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.

Complex integration: Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula..

UNIT – II

INTEGRATION USING RESIDUES

Complex power series: Radius of convergence – Expansion in Taylor's series-Maclaurin's series and Laurent series. Singular point – Isolated singular point – pole of order m – essential singularity. Residue theorem. Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

(c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

UNIT – III

PROBABILITY AND DISTRIBUTIONS

Conditional Probability – Bayes Theorem, Binomial, Poisson, normal distribution – related properties. Moment generating function.

UNIT – IV

SAMPLING DISTRIBUTIONS

Population and samples. Sampling distribution of mean (with known and unknown variance), proportion, variances. - Sampling distribution of sums and differences. Point and interval estimators for means, variances, proportions.

UNIT – V

TESTS OF HYPOTHESIS

Statistical Hypothesis – Errors of Type I and Type II errors and calculation. One tail, two-tail tests. Testing hypothesis concerning means, proportions and their differences using Z-test. Tests of hypothesis using Student's t-test, F-test and χ^2 test.

Simple Bivariant correlation and regression lines

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TEXT BOOKS

1. Engineering Mathematics Volume -III T. K. V. Iyengar, B. Krishna Gandhi and Others,
   S.Chand & Company.
2. Probability and Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.
3. Higher Engineering Mathematics, B.S.Grewel

REFERENCES

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
2. Probability and statistics by – ATHANASIOS-PAPOULIS-Pearson Edn.

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IV SEMESTER

S174 - CONTROL SYSTEMS
(Common to ECE, EEE, ME)

Pre Requisite: None

Course Objective:

The objective of this course is to introduce the principles and applications of control systems in day to day life, the basic concepts of block diagram, Signal flow graph, state space representation of system, time domain analysis, solutions to time invariant systems .It also deals with different aspects of stability analysis of systems in frequency and time domains.

Course Outcomes

After completion of the course, students will able to:

CO1. Develop mathematical modelling of electro mechanical system.
CO2. Determine Transient and Steady State behavior of systems using standard test signals.
CO3. Analyze linear systems for steady state errors, absolute stability and relative stability
CO4. Identify and design a control system to satisfy given requirements.

UNIT – I
INTRODUCTION - MATHEMATICAL MODELLING OF CONTROL SYSTEMS

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions – Translational and Rotational mechanical systems. Transfer Function of DC Servo motor - Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT – II
TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral, PID systems.

UNIT - III
FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications Polar Plots -Bode diagrams-Determination of Frequency domain specifications and Transfer function from the Bode Diagram-Phase margin and Gain margin- Nyquist Plots.

UNIT – IV
STABILITY ANALYSIS

The concept of stability – R-H stability criterion – qualitative stability and conditional stability – limitations of Routh's stability, The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci, Stability Analysis from Bode Plots -Nyquist Plots. Compensation techniques – Lag, Lead, Lead-Lag Compensator design in frequency Domain.

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UNIT – V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

TEXT BOOKS

1. B. C. Kuo , "Automatic Control Systems" John wiley and son's ,9th edition.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International (P) Limited Publishers,7th edition.

REFERENCES

1. Katsuhiko Ogata , "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition,1998.
2. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley, New Delhi,
3. Richard C Dorf, Robert H Bishop, Modern control systems , 12th edition, Prentice Hall (Pearson education, Inc.), New Delhi 2003.
4. Benzamin C. Kuo and Farid Golnaraghi, Automatic Control Systems, 9th Edition, John Wiley, New Delhi, 2003.

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IV SEMESTER

S342 - POWER GENERATION AND UTILIZATION

Pre-requisite course: None

COURSE OBJECTIVE:

This course enables the students to understand key concepts of Renewable and non-renewable power generation methods and economic aspects of power generation like load curve, load demand, diversity and plant utilization factors etc. Comprehend proper methodology for power tariff and understand parameters of utilization and Electric Heating along with Welding.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1 Understand the operation of renewable and non-renewable generating stations and their economical aspects.
CO2 Design a power circuit for utilization schemes.
CO3 Evaluate different tariff methods.
CO4 Understand the per-unit calculations.

UNIT – I

HYDEL AND THERMAL POWER GENERATION

The growth of electrical power generation, transmission and distribution systems in India. Typical layout of power system. Layout of hydro electric power station - types of hydro electric power stations - penstocks water hammer, surge tank, head and tail races. Selection of site for a hydel station, Advantages and disadvantages.

Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses- Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers. Selection of site for Thermal power station. Advantages and disadvantages, Comparison of hydel and thermal power stations.

UNIT – II

NUCLEAR AND RENEWABLE POWER GENERATION

Nuclear Power Stations: Nuclear Fission and Chain reaction- Nuclear fuels- Principle of operation of Nuclear reactor-Reactor Components: Moderators, Control rods, Reflectors and Coolants. Radiation hazards: Shielding and Safety precautions- Types of Nuclear reactors and brief description of PWR, BWR and FBR. Selection of site for Nuclear power plant. Advantages and disadvantages. Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only) Principles of Electric power generation using renewable energy sources- Solar, Wind and Wave energy (Qualitative treatment only)

UNIT - III

UTILISATION

Illumination: Terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Illumination Methods - Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

Electric Heating & Welding: Methods of electric heating - resistance heating, induction heating and dielectric heating, Advantages. Electric welding, Types - resistance and arc welding, Electric welding equipment, comparison between A.C. and D.C. Welding.

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UNIT - IV

ECONOMICAL ASPECTS OF POWER GENERATION AND TARIFF

Load curve, load duration and integrated load duration curves-Connected load, Maximum load, Average load, demand factor. Load factor, diversity factor, plant capacity factor, utilization and plant use factors, number and size of generating units – base load and peak load plants Numerical Problems.

Cost of electrical energy – fixed cost – depreciation methods, running cost. Tariff Methods: Flat Rate, Block-Rate, two-part, three-part and power factor. Numerical Problems.

UNIT - V

PER-UNIT SYSTEM

Per Unit quantities and advantages, change in the base of per unit quantities, single line or one line diagram, impedance and reactance diagram, Numerical problems.

TEXT BOOKS

1. C.L.Wadhawa, "Generation Distribution and Utilization of Electrical Energy", New Age International (P) Limited, 2011.
2. Godfrey Boyle, "Renewable Energy Power for a Sustainable Future", Oxford University Press, 3rd Edition.

REFERENCES

1. M.V. Deshpande , "Elements of Power Station design and practice", Wheeler Publishing.
2. E. Openshaw Taylor, "Utilisation of Electric Energy", Orient Longman, 2006.
3. V.K Mehta and Rohit Mehta, "Principles of Power Systems", S.CHAND& COMPANY LTD., New Delhi 4th Revised Edition.

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S217 - ELECTRICAL MACHINES - II

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

THREE PHASE INDUCTION MOTORS

Three-phase Induction motors-construction details-Production of a rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor reactance, rotor current and power factor- equivalent circuit - phasor diagram - crawling and cogging

UNIT – II

PERFORMANCE OF INDUCTION MOTORS

power stages -Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation- expressions for starting torque and running torque-condition for maximum torque–torque slip characteristics– losses and efficiency – starting methods-no load and blocked rotor tests –equivalent circuit – circle diagram, operation of induction motor as induction generator

UNIT – III

SINGLE PHASE INDUCTION MOTORS

Single phase Induction motors – principle of operation - double field revolving theory -split phase induction motor, capacitor start induction motor, capacitor start and run induction motor, shaded pole induction motor– equivalent circuit.

UNIT – IV

SYNCHRONOUS GENERATORS

Synchronous generator – construction, working principle- emf equation–types of rotors-armature reaction –phasor diagrams-regulation methods – EMF, MMF,ZPF methods – synchronizing to infinite bus bars – two reaction theory – parallel operation of synchronous generators-synchronous machine Constants(X_d, X_q)

UNIT – V

SYNCHRONOUS MOTORS

Synchronous motor – constructional features, principle of operation of synchronous motor – methods of starting - Damper winding– power developed by a synchronous motor – synchronous motor with different excitations – effect of increased load with constant excitation, effect of changing excitation with constant load – torque equation – V curve and inverted V curve – hunting.

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S127 - ANALOG ELECTRONICS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

TRANSISTOR AT HIGH FREQUENCY :

The hybrid Π Common Emitter Transistor model. Hybrid Π conductance in terms of low frequency h parameters- Transconductance, Input Impedance, Feedback conductance, Base spreading resistance, output conductance and hybrid Π capacitances. The CE short circuit current gain obtained with the hybrid-Π model- Bandwidth f_β and parameter f_T. Current gain with resistive load, Transistor amplifier response with source resistance- Gain Bandwidth product.

UNIT – II

LARGE SIGNAL AND TUNED AMPLIFIERS :

Classification of large signal Amplifiers, Distortion in Amplifiers- Second harmonic Distortion and Higher order harmonic distortion. Class A power amplifier- Direct coupled and Transformer Coupled Power Amplifier, Class B power amplifier- Push Pull and Complementary Symmetry power Amplifier., Class AB power amplifier, Class C power amplifier, Class D and S power Amplifiers. Introduction to tuned amplifiers.

UNIT – III

FEEDBACK AMPLIFIERS

Open loop Amplifiers- Voltage Amplifier, Current Amplifier, Transresistance Amplifier and Transconductance Amplifier. Closed loop Amplifiers- Classification of Negative Feedback Amplifiers and their analysis, Characteristics of Negative Feedback Amplifiers.

UNIT – IV

LINEAR WAVESHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT – V

NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Zener diode clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits.

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TEXT BOOK

1. Jacob Millman, Christos C Halkias and Satyabrata Jit, Millman's Electronic Devices and Circuits, Tata McGraw Hill, Second Edition, New Delhi, 2008.
2. J. Millman and H. Taub -Pulse, Digital and Switching Waveforms - McGraw-Hill, 1991

REFERENCES

1. R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, Pearson/Prentice Hall,9th Edition,2006.
2. S Salivahanan, N.Suresh Kumar and A Vallavaraj, Electronic Devices and Circuits, McGraw Hill, 5th edition, 2010.
3. T.F. Bogart Jr., J.S.Beasley and G.Rico, Electronic Devices and Circuits, Pearson Education, 6th edition, 2004.
4. Anand Kumar - Pulse and Digital Circuits – PHI, 2005.

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S189 - DIGITAL ELECTRONIC CIRCUITS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Number Systems: Number system, complements, signed Binary numbers. Binary Arithmetic, Binary codes –BCD, Excess 3 code, Gray code, Error detecting and correcting code – Hamming code, conversion from one code to another.
Boolean Algebra: Boolean postulates –De-Morgan's Theorem, Principle of Duality, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS)- Minterm and Maxterm, Canonical forms – Conversion into canonical form–Karnaugh map Minimization (up to 5 variables)- Don't care conditions.

UNIT - II

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive –OR and Exclusive – NOR, positive logic and negative logic, Realization of Boolean Functions using logic gates (Multi level gate implementations- AND -OR, OR - AND, NAND -NAND, NOR -NOR, NAND-NOR & NOR -NAND realizations. AND, OR, NOT, NAND and NOR gates using Resistors, Diodes and Transistor.

UNIT - III

Combinational Logic Circuits: Design procedure, Adders and Subtractors – Serial adder/ Subtractor, Parallel adder/ Subtractor- Carry look ahead adder, BCD adder, Magnitude Comparator, Decoder, encoder, Multiplexer, Demultiplexer, Parity checker, code converters.
Memories- Read Only memory and types of ROM, Random access Memory and types of RAM; Programmable Logic Devices–Programmable Logic Array, Programmable Array Logic. Implementation of combinational logic using MUX, PROM, PAL and PLA.

UNIT - IV

Sequential Logic Circuits: Latches, Flip flops-SR, JK, T, D and Master slave – Characteristic and excitation tables, characteristic equations. Modes of triggering – Edge and Level Triggering, Realization of one flip flop using other flip flops, Registers and their operation, synchronous and Asynchronous counters, modulo – n counters, Race around condition, Hazards: Static ,Dynamic, Essential –Hazards elimination.

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UNIT - V

Asynchronous Sequential Circuits: Sequence detector. Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines.
Algorothimic State Machines: Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations.

TEXTBOOKS

1. Morris Mano, "Digital Design", PHI Publishers.
2. Zvi Kohavi, Switching & Finite Automata theory, TMH Publishers.

REFERENCES

1. Charles H. Roth, Fundamentals of Logic Design, Cengage learning Publishers.
2. M.Subramanyam,"Switching Theory and Logic Design", University Science Press Publishers.
3. John M. Yarbrough, "Digital Logic: Applications and Design", Thomson Publications.
4. Anandakumar,"Switching Theory and Logic Design", PHI Publishers.

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S243 - ENVIRONMENTAL STUDIES

Lecture	:	0 Periods / Week	Internal Marks	:	25
Tutorial	:		External Marks	:	75
Credits	:		External Examination	:	3 hrs.

UNIT – I

Natural Resources: Definition, Scope and importance of Environmental Studies – Need for Public Awareness. Renewable and non-renewable resources –
Natural resources and associated problems – Forest resources, Water resources, Mineral resources, Food resources and Energy resources.

UNIT - II

Ecosystems: Concept of an ecosystem - Structure and functions of an ecosystem - Producers, consumers and decomposers. Energy flow in the ecosystem, Ecological succession, Food chains, Food webs and ecological pyramids. Bio-Geo Chemical Cycles.
Biodiversity and its conservation: **Introduction** – Definition & Levels of Measuring Biodiversity: Genetic, Species, Community and Ecosystem diversity.
Bio-geographical classification of India, India as a mega diversity nation, Values of Biodiversity: Direct and Indirect Values, Hot-spots of biodiversity, Threats to biodiversity, Man-wildlife conflicts, Endangered and endemic species of India. Conservation of biodiversity.

UNIT - III

Environmental Pollution: Definition, Sources, Effects and Control measures of

a) Air pollution
b) Water pollution
c) Soil pollution
d) Noise pollution
e) Radioactive Pollution

Solid waste Management: Sources of waste, Effects of improper handling of waste and measures to reduce the waste production and management methods of Municipal solid waste.
Disaster management: Floods, Earthquakes, Cyclones, Landslides and Tsunami.

UNIT - IV

Social Issues and the Environment: From Unsustainable to Sustainable development & Equitable use of resources for sustainable life style - Environment and human health - Resettlement and Rehabilitation of people, its problems and concern & Case Studies - Climate change : Global warming, Acid rains, Ozone layer depletion, Nuclear accidents and Holocaust & Case studies - Consumerism and waste products.

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UNIT -V

Human Population and the Environment: Population growth & Variations among Nations, Population explosion – Family Welfare Program - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health & Case Studies. Environmental legislation in India.

TEXT BOOKS

1 P.N.Palanisamy et al., "Environmental Science" 2nd edition, Dorling Kindersley (India) Pvt.Ltd. Licenses of Pearson Education in South Asia, 2013.

2 R. Rajagopalan, "Environmental Studies (From Crisis to Cure)", by Oxford University Press, 2011, Second Edition.

REFERENCE

1. M. Anji Reddy, "Textbook of Environmental Sciences and Technology" by BS Publications, 2011 Second Edition.

2. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", by University Grants Commission, University Press (India) Private Limited, 2005. (2010 Reprinted).

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L127 - CONTROL SYSTEMS LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

LIST OF EXPERIMENTS

CYCLE-I

1. Modelling of Physical Systems using MATLAB/SIMULINK(Mechanical and ELectrical systems).
2. Block Diagram Reduction of Linear Systems Using MATLAB.
3. Time response analysis of Linear Systems Using MATLAB.
4. Frequency response analysis of Linear Systems Using MATLAB.
5. Stability Analysis of Linear Systems Using MATLAB(Root Locus, Bode and Nyquist plot).

CYCLE-II

6. Time Response analysis of Second Order System.
7. Study the Effect of P, PD, PI, PID controllers on second order systems.
8. Magnitude and phase plot of Lag and lead compensators.
9. Determination of transfer function and effect of feedback on DC servo motor.
10. Effect of P, PD, PI, PID controllers on Temperature control system.

Additional Experiments

11. Designing Lag and Lead Compensators for given system by using MATLAB.
12. Stepper motor control using LABVIEW.

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L136 - ELECTRICAL MACHINES - I LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

LIST OF EXPERIMENTS

1 Predetermination of Efficiency & Regulation of 1-phase transformer

2 Predetermination of Efficiency & Regulation of two identical 1-phase transformers

3 Determination of Efficiency & Regulation of 1-phase Transformer by direct test

4 Conversion of Three phase to two phase by using two identical transformers

5 Determination of Stray losses in a DC Shunt Motor by Retardation test

6 Determination of critical resistance and critical speed of D.C. shunt generator

7 Predetermination of Efficiency of D.C. shunt machine & Speed control of D.C. shunt motor

8 Performance characteristics of D.C. shunt motor

9 Determination of efficiency of DC shunt machine by conducting back to back test

10 Separation of stray losses in a D.C. shunt motor.

Additional Experiments

11 Load characteristics of a separately excited D.C. Generator

12 Calculation of voltage regulation for a 1-phase transformer using lab-view

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S288 - LINEAR AND DIGITAL IC APPLICATIONS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

OPERATIONAL AMPLIFIER:

Basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features. Basic applications of op-amp- Adder, Subtractor, Adder-Subtractor, instrumentation amplifier, V to I and I to V converters, sample & Hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators.

UNIT – II

ACTIVE FILTERS & OSCILLATORS:

Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and Quadrature type, waveform generators-triangular, sawtooth, square wave and VCO.

UNIT – III

TIMERS & A/D-D/A CONVERTERS:

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, PLL-introduction, block schematic, principles and description of individual blocks of 565. CONVERTERS - Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, different types of ADCs – parallel comparator type ADC, counter type ADC and dual slope ADC. DAC and ADC specifications.

UNIT – IV

LOGIC FAMILIES & COMBINATIONAL CIRCUITS

Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS&CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS &CMOS driving TTL. Design using TTL -74XX series, decoders, Demultiplexers, Encoder, priority Encoder, multiplexers & their applications, parity generators/checker circuits. Digital arithmetic circuits- parallel binary adder/subtractor circuits using 2's compliment system, Digital comparator circuits.

UNIT – V

SEQUENTIAL CIRCUITS & MEMORIES

74XX series of IC counters ,ROM architecture, types & applications, RAM architecture, Static & Dynamic RAMs, synchronous DRAMs.

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TEXT BOOKS

1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, 2nd Ed., 2003.
2. Floyd and jain, "Digital fundamentals", Pearson Education, 8th Eition, 2005.

REFERENCES

1. R.F. Coughlin and Fredrick F Driscoll, "Operational Amplifiers and Linear Integrated circuits".,PHI, 1977.
2. Denton J. Daibey, "Opeational Amplifiers and Linear Integrated circuits: Theory and Applications", TMH.
3. serigo Franco, "Design with Operational amplifiers and Analog Integrated circuits", McGraw Hill, 3rd Ed., 2002.
4. J.Michael Jacob, "Applications and Design with Analog Integrated Circuits" 2nd Edition, PHI,2000
5. Ramakanth A. Gayakwad, "Op-Amp & Linear ICs", PHI, 1987.

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S341 - POWER ELECTRONICS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

POWER SEMI-CONDUCTOR DEVICES

Power semiconductor switches–Characteristics of SCR–Two transistor model- Static and dynamic characteristics–Turn on and Turn off methods-Series and Parallel operation of thyristors-Gate triggering circuits-Rating and protection-Snubber circuits-Characteristics of Power diode-Power BJT-Power MOSFET-GTO & IGBT.

UNIT – II

COMMUTATIONS & PHASE-CONTROLLED RECTIFIERS

Commutation circuits: Natural commutation, Forced commutation circuits–Self, Impulse, Resonant pulse, complimentary and external pulse commutation

Single phase and three phase- Half wave, Full wave and bridge controlled rectifiers with R and RL loads–continuous and discontinuous modes-effect of freewheeling diode-Dual converters(both single phase and three phase)–Effect of Source impedance, Problems.

UNIT – III

INVERTERS

Single phase inverter–Voltage Source Inverter (VSI)-Current source inverters(CSI) - Comparison between VSI and CSI- Analysis with R & RL loads-3-phase inverters–180 and 120 degree mode of operation-PWM Techniques, Single Pulse Width Modulation, Multiple Pulse Width Modulation, Sinusoidal & Modified Sinusoidal PWM-Hysteresis Current Controlled PWM techniques- Applications.

UNIT – IV

DC TO DC CONVERTERS

Principle of operation-Control Strategies, Step-up and step-down chopper–Chopper classification- Derivation of average load voltage, load current for continuous/discontinuous current operation- Analysis of Class A chopper -Problems.

UNIT – V

AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

AC voltage controllers–single phase ac voltage controller with R and RL loads– continuous and discontinuous modes- Principle of operation of Cyclo-converter -Single phase to single phase cyclo converters -Step up and step-down cyclo converters -Problems.

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M. Chandra
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TEXT BOOKS

1. Md.H.Rashid "Power Electronics", Pearson Education Third Edition, First Indian Reprint- 2008
2. Dr.P.S. Bhimbra, " Power Electronics", Khanna Publishers, 2006.

REFERENCES

1. Ned Mohan, T.M. Undeland and William P.Robbins, "Power Electronic Converters, Applications", 3rd Edition, John Wiley & Sons, 2009
2. M D Singh, K B Khanchandani "Power Electronics", Tata MC Graw Hill Publishers, 2nd Edition.

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S219 - ELECTRICAL POWER TRANSMISSION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solid conductors –Skin & Proximity Effects- effect on Resistance of solid conductor. Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Sag and Tension calculations with equal & unequal heights of towers, effect of wind, temperature and ice on weight of conductor-numerical problems.

UNIT – II

PERFORMANCE OF TRANSMISSION LINES

Classification of Transmission Lines - Representation of short transmission lines using generalized parameters (A, B, C, D), Performance of Short lines. Representation of Medium Lines-Nominal-T, Nominal-π. Representation of Medium lines using generalized parameters (A, B, C, D), Performance of Medium lines. Representation of Long Transmission lines-Rigorous Solution. Interpretation of the long line equations, Incident, Reflected, Refracted Waves-Surge Impedance and Surge Impedance Loading of long line, Wave length & Velocity of propagation of waves. Equivalent T & Equivalent π Representation of long lines. Representation of ling line using generalized parameters (A, B, C, D). Performance of Long line-Charging current-Ferranti Effect-Expressions for Active & Reactive powers in terms of A, B, C, D parameters with sending end and receiving end quantities. Numerical Problems.

UNIT – III

UNDERGROUND CABLES

Types of Cables-Construction-Types of Insulating materials. Calculations of Insulation resistance and Dielectric Stress. Capacitance of Single-core and 3-Core belted cables. Grading of Cables, Types - Capacitance grading, Inter-sheath grading- numerical problems.

UNIT – IV

OVERHEAD LINE INSULATORS & CORONA

Types of Insulators, String efficiency and Methods for improvement, voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding. Numerical Problems. Corona - Description of the phenomenon, factors affecting corona, Critical voltages and power loss, Methods to reduce corona loss, Interference with nearby communication lines.

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REFERENCES

1. Rangwala.S.C., "Engineering Materials", Charotar Publishning House Pvt.Ltd, Gujarat, 2011.
2. R.Balasubramaniam, "Callisters Materials Science and Engineering", Wily India(p) Ltd., 2010.
3. S.O.Kasap, "Principles of Electrical Engineering Materials", MGH.
4. Allison, "Electronic Engineering Materials and Devices" TMH.
5. Ruska N Scot, "Microelectronic processing – an introduction to the manufacture of integrated circuits", MGH.
6. Tasneem Abbasi, S.A.Abbasi, "Renewable Energy Sources – Their Impact on Global Warming and Pollution" , PHI (Pvt.Ltd.), New Delhi.

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S227 - ELEMENTS OF SIGNAL PROCESSING

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTRODUCTION TO SIGNAL PROCESSING

Digital Signal Processing- Discrete time signals & sequences, linear shift invariant systems, stability, and causality- Linear constant coefficient difference equations- Frequency domain representation of discrete time signals and systems, Sampling Theorem, Convolution theorem

UNIT – II

DISCRETE FOURIER SERIES & FAST FOURIER TRANSFORM

Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT. Relation between Z-transform and DFS-Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency, FFT Algorithms, Inverse FFT, and FFT for composite N

UNIT – III

REALIZATION OF DIGITAL FILTERS

Review of Z-transforms, Applications of Z – transforms, solution of difference equations of digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function

UNIT – IV

IIR DIGITAL FILTERS

Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations

UNIT – V

FIR DIGITAL FILTERS

Characteristics of FIR Digital Filters, frequency response- Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters

TEXT BOOKS

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", Pearson Education / PHI, 2007
2. A.V.Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI

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REFERENCES

1. Andreas Antoniou "Digital Signal Processing", TATA McGraw Hill , 2006
2. MH Hayes, Schaum's , "Digital Signal Processing: Outlines", TATA Mc-Graw Hill, 2007.
3. C. Britton Rorabaugh, "DSP Primer", Tata McGraw Hill, 2005.
4. Robert J. Schilling, Sandra L.Harris "Fundamentals of Digital Signal Processing using Matlab", Thomson, 2007.
5. Lonnie, Cludeman, " Fundanentals of DSP", John willey & sons

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S406 - THERMAL AND HYDRO PRIME MOVERS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Basic Thermodynamics
Fundamental Concepts -Thermodynamic System- types, State, Path, Process and Cycle. Work done in Constant Pressure, Constant Volume, Constant Temperature and Reversible Adiabatic, Polytropic Process.
Zeroth Law- Equality of temperature.
First Law: First Law of Thermodynamics: Statement-Internal Energy-Enthalpy-Specific Heat – Steady Flow Energy Equation.
Second Law: Second Law of Thermodynamics: Kelvin-Plank and Clausius Statements, Reversible Process-Carnot Cycle.

UNIT – II

Internal Combustion Engines
Classification-Working principle of Spark Ignition and Compression Ignition Engines-2 Stroke & 4 Stroke Engines. Valve and Port timing diagrams
Gas Turbines: Introduction, Classification of Gas Turbines, Analysis of Closed and Open cycle Gas Turbine plants, Applications of Gas turbines, performance parameters. Basic problems

UNIT – III

Steam Turbines
Introduction, working principle, Classification, Impulse turbine- Mechanical details, Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency. Applications of steam turbines.

UNIT – IV

Fluid Mechanics
Introduction- Properties of Fluids-Pressure, Density, Specific Weight, Specific Gravity, Viscosity-Types of Fluids-Types of Fluid Flows-Continuity, Momentum and Bernoulli's Equation .
Pressure measurement: Simple Manometers- Piezometer, U-tube manometer, Single column Manometer. Differential U-tube manometer.
Flow Measurements: Orifice meter, Venturimeter, Rotameter.

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UNIT – V

Hydraulic Turbines

Introduction - Classification of Hydraulic turbines - Pelton Wheel, Francis, Kaplan and Propeller Turbines - Working principle, Performance and Work done.

TEXT BOOKS

1. Mahesh M Rathore, "Thermal Engineering", TMH New Delhi, 2010.
2. Modi, P.N. & Seth, S.M., "A Text book of Fluid Mechanics and Hydraulic Machines", Standard Book House, New Delhi, 2007

REFERENCES

1. V Ganesan, "Internal Combustion Engines", 4th Edition, McGraw-Hill, 2012.
2. R.K.Bansal, "Fluid Mechanics and Hydraulic Machines", 9th Edition, laxmi publications.
3. White F.M., "Fluid Mechanics", McGraw-Hill Professional, 2003.

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S169 - COMPUTER ORGANIZATION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

Pre-Requisite: Digital Electronics.

UNIT – I

Register Transfer and Micro Operations: Register Transfer language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.
Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions– Instruction cycle, Memory – Reference Instructions, Input – Output and Interrupt.

UNIT – II

Micro Programmed Control: Control Memory, Address Sequencing, Micro program example, Design of Control unit, hard wired control, Micro programmed control.
Central Processing Unit: STACK organization, Instruction formats, Addressing modes, DATA Transfer and Manipulation, Program control, Reduced Instruction Set computer.

UNIT – III

Pipelining and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC pipeline, Vector Processing.
Computer Arithmetic: Data Representation, Fixed Point Representation, Floating Point Representation, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT – IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory. Associative Memory, Cache Memory, Virtual Memory.

UNIT – V

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input –Output Processor, Serial communication.

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LBRCE EXAMINATION SECTION

TEXT BOOK

1. M.Morris Mano, "Computer Systems Architecture", Pearson Education publishers.

REFERENCES

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky, "Computer Organization", Tata McGraw Hill publishers.
2. William Stallings, "Computer Organization and Architecture", Sixth Edition, Pearson/PHI publishers.
3. Andrew S. Tanenbaum, "Structured Computer Organization", Pearson/PHI publishers.
4. Sivaraama Dandamudi, "Fundamentals or Computer Organization and Design", Springer publishers.

LBRCE EXAMINATION SECTION

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V SEMESTER

L137 - ELECTRICAL MACHINES-II LAB

Prerequisite: Electrical Machines-II

Course Objectives:

This course is designed to give practical exposure to students on DC machines and transformers.

Course Outcomes:

After Completion of the course student will be able to:

CO1: Develop the Equivalent circuit of Induction motor.
CO2: Analyze the performance of AC machines.
CO3: Calculate the regulation of alternator experimentally.
CO4: Identify a suitable machine along with rating for a specific application.

LIST OF EXPERIMENTS

1. Performance characteristics of squirrel cage induction motor
2. Regulation of 3-phase alternator by synchronous impedance & MMF method
3. Separation of core losses in a Single Phase Transformer
4. Plot the circle diagram of three-phase induction motor
5. Plot the V & inverted V curves of a synchronous motor
6. Calculation of equivalent circuit parameters for a single-phase induction motor
7. Regulation of three-phase alternator by ZPF Method
8. Determination of efficiency and regulation of three-phase alternator by direct test
9. Performance characteristics of single phase induction motor
10. Performance characteristics of three-phase slip ring induction motor

ADDITIONAL EXPERIMENTS

11 Calculation of direct and quadrature axis reactances of a salient pole synchronous machine

12 Torque-Speed characteristics of Induction motors using Lab- view

13 Speed control of Induction motor using MATLAB / Simulink

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V SEMESTER

L106 - ANALOG AND DIGITAL ELECTRONICS LAB

Pre requisite: Basic Electronic Devices and Circuits, Digital Electronics Circuits, Analog Electronics Circuits

Course Objective:

This lab course is intended to know the use and design of Logical gates, Flip-Flops ,Op-Amp, multivibrator circuits using 555IC and voltage regulators.

Course Outcomes:

At the end of this course student will be able to

CO1. Understand the realization of logic gates.
CO2. Design Logic gates and Flip-Flops
CO3. Analyze clippers and Clampers
CO4. Design multivibrators, Voltage regulators

LIST OF EXPERIMENTS

CYCLE-I

1.Realization of logic gates using discrete components
2.Representation of logic gates with universal gates
3.Design of SR and JK Flip Flops
4.Linear wave shaping-low pass and high pass circuits
5.Nonlinear wave shaping-clippers and clampers circuits

CYCLE-II

6.Realisation of adder, substractor, comparator circuits using op-Amplifier
7. Designing of LPF,HPF(first order) using Op-Amplifier
8.Designing of Differentiator and Integrator using Op-Amplifier
9. Designing of Differentiator Monostable and Astable operation circuits using IC 555 timer
10. Designing of Voltage regulator using IC 723

ADDITIONAL EXPERIMENTS

11. Design of half and full adder and substractor
12. Design of Schmitt trigger

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VI SEMESTER


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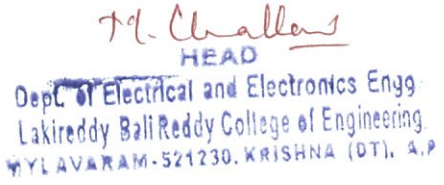
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VI SEMESTER

S213 - ELECTRICAL DISTRIBUTION SYSTEMS

Pre-requisite course: Power Generation & Utilization

COURSE OBJECTIVES:

This course will introduce the basic fundamentals of distribution system planning and automation. It also provides the knowledge about the transmission of power from the generating stations to distribution substation. Apart from this, it also deals with voltage control methods.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Understand different types of loads and their characteristics.
CO2: Design a distribution system for a given geographical service area.
CO3:Understand the communication systems in distribution and automation.
CO4: Apply power factor correction and voltage control methods to power system problems .

UNIT – I

INTRODUCTION

Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor loss factor – relationship between the load factor and loss factor. Classification of loads (residential, commercial, agricultural and Industrial) and their characteristics.

UNIT – II

DISTRIBUTION FEEDERS

Design Considerations of Distribution Feeders; Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

DC & AC Distribution Systems - Classification of Distribution Systems- Requirements & Design features of Distribution systems-voltage drop in DC distribution system-Radial and Ring Main Distributor. Voltage drop in AC distribution-power factors referred to receiving end, power factors referred to respective load points. Numerical Problems.

UNIT – III

SUBSTATIONS

Selection of site for substation, Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substation layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams. Introduction to Gas Insulated Substations (GIS) and its advantages.

Distribution Substations - Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

UNIT – IV

DISTRIBUTION AUTOMATION AND COMMUNICATION SYSTEMS

Introduction to Distribution Automation (DA), control system interfaces, control and data requirements, DA Hardware, DAS software. DA capabilities, Automation system computer facilities, management processes, Information management, system reliability management, system efficiency management, voltage management, Load management.

COMMUNICATION SYSTEMS: DA communication requirements, Distribution line carrier (Power line carrier), Ripple control, Zero crossing technique, telephone, cable TV, Radio, AM broadcast, FM SCA, VHF Radio, UHF Radio, Microwave satellite, fiber optics, Hybrid Communication systems, Communication systems used in field tests.

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UNIT – V

VOLTAGE CONTROL AND POWER FACTOR IMPROVEMENT

Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

Capacitive compensation for power factor control, Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation- Economic justification- Procedure to determine the best capacitor location.

TEXT BOOKS

1. Turan Gonen, "Electric Power Distribution system, Engineering", Tata McGraw-Hill Publication, 2nd Edition.
2. V. Kamaraju, Electrical Power Distribution Systems, Right Publishers.

REFERENCES

1. A.S. Pabla, "Electric Power Distribution", Tata McGraw - Hill Publication, 6th Edition.
2. C.L.Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", New Age International (P) Limited, 3rd Edition.

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S345 - POWER SYSTEM ANALYSIS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

POWER SYSTEM NETWORK MATRICES

Graph Theory: Definitions, relevant concepts in graph theory, Network Matrices, Y_{bus} formation by Direct Inspection and Singular Transformation Methods, Z_{bus} building algorithm. Numerical Problems.

UNIT – II

POWER FLOW METHODS

Review of per-unit system, power flow problem formulation, solution of non-linear algebraic equations by Guass-Seidel and Newton-Raphson methods, Power flow solution by Newton's method in polar coordinates, flow charts, solution of small systems.

UNIT – III

POWER FLOW METHODS CONTINUED

Sensitivities of system operating parameters, derivation of Fast Decoupled Load flow, comparison with Newton-Raphson method, DC Load flow and applications, Introduction to optimal ordering of system of equations, triangular factors, sparcity.

UNIT – IV

NETWORK FAULTS AND FAULT CALCULATIONS

Symmetrical Fault (LLL) Analysis: Short circuit of synchronous machine unloaded, Short circuit of loaded synchronous machine. Calculation of symmetrical short circuit currents for simple systems, short circuit current computation through Thevenin's theorem. Symmetrical components transformation, phase shift in Y/Δ transformers, sequence impedance of transmission lines, sequence impedance and networks of power system, sequence impedance and network of synchronous machine, sequence impedance and networks of transformers, construction of sequence networks of a power system, computation of circuit breaker capacities - Short Circuit Current and MVA Calculations, Numerical Problems. **Unsymmetrical Fault Analysis:** LG, LL, LLG faults with and without fault impedance, Numerical Problems.

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UNIT – V

POWER SYSTEM STABILITY

Elementary concepts of Steady State, Dynamic and Transient Stabilities-Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability. Formulation of Swing Equation and its solution, determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation, Methods to improve Steady State and Transient Stability.

TEXT BOOKS

1. John J Grainger, W D Stevenson Jr., "Power System Analysis", T M H, 2nd Edition 2003.
2. D.P. Kothari, I.J. Nagrath, "Modern Power System Analysis", T M H New Delhi, 3rd Edition 2003

REFERENCES

1. G.W. Stagg & A.H. El-Abiad, "Computer Methods in Power System Analysis", 1968.
2. Prabha Kundur, "Power System Stability and Control", T M H Edition, 2006.
3. M.A. Pai, "Computer Techniques in Power System Analysis" TMH.
4. Hadi Saadat, "Power System Analysis"– TMH Edition 3rd Edition, 2011.
5. Abhijit Chakraborty, Sunita, Halder, "Power System Analysis: Operation and Control", (III Ed.), PHI Learning Pvt Ltd., New Delhi, 2010.

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S313 - MICROPROCESSORS AND MICROCONTROLLERS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

Pre requisite: Digital Circuits, Computer organization

UNIT – I

Microprocessor Architecture: Introduction to Microprocessors-Purpose of a Microprocessor, different types of Microprocessors, their features and their comparison; 8086 Microprocessor-Architecture and Pin diagram of 8086, Special functions of General purpose registers, 8086 flag register and function of 8086 Flags, Addressing modes of 8086.
Instruction Set: Instruction set of 8086, Assembly language programs involving logical, Branch and Call instructions, Sorting, Evaluation of Arithmetic Expressions, String manipulation, Assembler directives, simple programs, procedures, and macros.

UNIT – II

8086 Memory and I/O Interfacing: Minimum mode and maximum mode of operation, Timing diagram, Memory interfacing to 8086 (Static RAM & EPROM).

UNIT – III

Peripherals and Interfacing: Need for DMA. DMA data transfer Method, Interfacing with 8237/8257, 8255 PPI – various modes of operation and interfacing to 8086, Keyboard and Seven segment Displays, Stepper Motor and actuators, D/A and A/D converter interfacing.

UNIT – IV

Interrupts: Interrupt structure of 8086, Interrupt Vector table, Interrupt service routines, Introduction to DOS and BIOS interrupts, 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.
Data transfer: Serial data transfer schemes, RS 232C, TTL to RS 232C and RS232C to TTL conversion, 8251 USART architecture and interfacing.

UNIT – V

Microcontroller: 8051 Microcontroller Architecture, Register set of 8051,Instruction Set and Programs, Modes of timer operation, Serial port operation, Interrupt structure of 8051, Memory and I/O interfacing of 8051.

TEXT BOOK

1. A.K.Ray and K.M. Bhurchandi ,Advanced Microprocessor And Peripherals (2/e), TMH Publishers.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.Mckinlay "Microcontrollers and Embedded System", Pearson Education Publishers.

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REFERENCES

1. Douglas V. Hall, "Micro Processors & Interfacing", TMH, 2007.
2. Raj Kamal, Microcontrollers Architecture, Programming, Interfacing and System Design, Pearson Education Publishers.
3. J.K.Uffenbeck, "The 8088 and 8086 Micro Processors", PHI, 4th Edition, 2003.
4. Ajay Deshmukh, "Micro Controllers-Theory and Applications" , Tata McGraw Hill Publishers.
5. Kenneth J.Ayala, "The 8051 Micro Controller", Cenage Learning Publishers.

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VI SEMESTER

S429 - OPTIMIZATION TECHNIQUES IN ENGINEERING

Pre-requisite course: NONE

COURSE OBJECTIVES:

The course aims at integrating traditional design methodologies with concepts and techniques of modern optimization theory and practice. The objective of this course is to introduce students to various solution methods of un-constrained and constrained decision-making problems. Topics include solvers for linear and nonlinear optimization problems of engineering applications.

COURSE OUTCOMES

After completion of the course, students will be able to

CO1 Recognize the importance of optimization techniques in solving real time problems
CO2 Apply linear and nonlinear programming methods for optimization problems.
CO3 Apply dynamic programming methods for real time Optimization problems.
CO4 Understand non traditional optimization techniques.

UNIT-I

Introduction to optimization

An overview of optimization problem, concepts and terms related to optimization, necessary and sufficient conditions for a multivariable function, Effects of scaling or adding a constant to an objective function, understanding of constrained and unconstrained optimization problems, properties of convex function and definiteness of a matrix and test for concavity of a function, Numerical examples.

UNIT-II

Linear Programming (LP)

Simplex method, matrix form of simplex method, solution of linear programming problems in tabular form via simplex method, Two-Phase simplex method, Duality in simplex method, Dual simplex method, Sensitivity analysis.

UNIT-III

Non-Linear Programming -Unconstrained optimization techniques

Lagrange multipliers, gradient descent method, steepest descent method, Newton's method, Davison-Fletcher-Powell method, Exterior point method, Numerical examples.

UNIT-IV

Non-Linear Programming -constrained optimization techniques

Karush-Kuhn-Tucker(KKT) conditions, convex optimization, quadratic optimization, quadratically constrained quadratic optimization and local & global optima, solution of quadratic programming problems using KKT necessary condition, numerical examples.

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UNIT-V

Dynamic optimization& Nontraditional optimization

Concept of functional, variational problems and performance indices, Euler-Lagrange equation to find the extremal of a function, Transversality condition, optimal control with constraints on input, optimal saturating controllers, Dynamic programming-principle of optimality, concept of time optimal control problem and mathematical formulation of problem, solution of time-optimal control problem, numerical example.

New generation optimization techniques-introduction to genetic algorithm, particle swarm optimization.

TEXT BOOKS

1. S.S. Rao ,"Engineering Optimization – Theory and Practice", III Edition, John Wiley & Sons 1996 and New Age International Pvt Ltd., New Delhi, 2002.
2. Kalyanmoy Deb, "Optimization for Engineering Design - Algorithms and Examples", PHI Learning Private Ltd, New Delhi, 1995.

REFERENCES

1. K.V. Mittal and C Mohan, "Optimization Methods in Operations Research and Systems Analysis", II edition 1983, New Age International Publishers, New Delhi.
2. Christos H Papadimitriou and Kenneth Steiglitz, "Combinatorial Optimization – Algorithms and Complexity", Prentice Hall of India 1997.
3. J C Pant, "Introduction to Optimization & Operations Research", IV Edition, Jain Brothers, New Delhi.
4. D.E. Goldberg, "Genetic Algorithms in Search, optimization and machine learning: Reading, Mass", Addison-Wesley, 1989.
5. Winston, WL and Venkataramanan,M.,"Introduction to Mathematical Programming", 4th Edn., Duxbury Press, 2002.

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S105 - ADVANCED ELECTRICAL MACHINES

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

SERVO MOTORS

Servomotors: General principle of operation, Types of Servomotors
D.C Servomotors: Armature controlled D.C Servomotor-Field controlled D.C Servomotor and their transfer functions, speed-torque characteristics Applications
A.C Servomotors: Principle of Operation, Construction and working, Speed-Torque Characteristics, Transfer function of an A.C servo motor.

UNIT – II

STEPPER MOTORS

Introduction, Constructional features, Principle of operation, Variable Reluctance (VR) stepping motor, Characteristics of Stepper Motor in Open Loop Drive, open loop and closed loop control of stepper motor. Applications, problems.

UNIT – III

SWITCHED RELUCTANCE MOTORS

Introduction, Constructional features, Principle of operation, Power Converter for SR Motor, Drive and power circuits, Torque equation, Torque-speed Characteristics, and Control of SR Motor for Traction type load, Applications, problems.

UNIT – IV

PERMANENT MAGNET BRUSHLESS D.C MOTORS

Introduction, permanent magnetic material, magnetic characteristics, minor hysteresis loops and recoil line, evaluation of PMBLDC motor, comparison of PMBLDC motor with conventional DC motor and induction motor, stator frames of Conventional PM DC Motors, Equivalent circuit of a PM, PM Brushless D.C motor-principle of operation, construction, d-q analysis of BLDC motor, Applications, problems

UNIT – V

COMMUTATOR MOTORS

Introduction-construction–Principle of operation-torque equation-Characteristics – Universal motor, Repulsion motor and linear motors – types (LIM, DCLM, LSM), Applications.

TEXT BOOKS

1. J.Gnanavadivel, Dr.S.Muralidharan, J.Karthikeyan, " Principles of Special Electrical Machines", Anuradha Publications, 2012
2. K.Venkataratnam, "Special Electrical Machines", University Press

REFERENCES

1. Naser A and Boldea I, "Linear Electric Motors: Theory, Design and Practical Application", Prentice Hall Inc., New Jersey,1987
2. Charles I. Hubert, "Electric Machines-Theory, operation, Applications and control", Pearson Publications.
3. P.S.Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers, 5th edition, 2013.

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VI SEMESTER

S278 - INTELLIGENT CONTROL SYSTEMS

Pre-requisite course: Control Systems

COURSE OBJECTIVES:

This course will introduce the basic principles of soft computing techniques. It covers simple representation schemes, problem solving paradigms, fuzzy logic and genetic algorithm.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1 Apply artificial Intelligence techniques.
CO2 Understand different types of perceptron models.
CO3 Understand different types of fuzzy sets, member ship functions and their implementation methods.
CO4 Solve problems by applying a suitable search method.

UNIT-I: Introduction to Neural Networks

Evolution of neural networks; Artificial Neural Network: Basic model, Classification, Feed forward and Recurrent topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Fundamentals of connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline.

UNIT–II ANN-I

Topology of Multi-layer perceptron, Back propagation learning algorithm, limitations of Multi-layer perceptron. Radial Basis Function networks: Topology, learning algorithm; Kohenen's self-organising network: Topology, learning algorithm; Bidirectional associative memory Topology, learning algorithm, Applications.

UNIT–III ANN-II

Recurrent neural networks: Basic concepts, Dynamics, Architecture and training algorithms, Applications; Hopfield network: Topology, learning algorithm, Applications.

UNIT–IV FUZZY LOGIC-I

Classical and fuzzy sets: Introduction, Operations and Properties, Fuzzy Relations: Cardinality, Operations and Properties, Equivalence and tolerance relation, Value assignment: cosine amplitude and max-min method; Fuzzification: Membership value assignment- Inference, rank ordering, angular fuzzy sets. Defuzzification methods, Fuzzy measures, Fuzzy integrals, Fuzziness and fuzzy resolution; possibility theory and Fuzzy arithmetic; composition and inference; Considerations of fuzzy decision-making.

UNIT-V FUZZY LOGIC-II

Basic structure and operation of Fuzzy logic control systems; Design methodology and stability analysis of fuzzy control systems; Applications of Fuzzy controllers. Applications of fuzzy theory.

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REFERENCES

1. James A Freeman and Davis Skapura, "Neural Networks" ,Pearson Education, 2003.
2. Rajasekharan and Pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and aplications" ,PHI Publication, 2003.
3. Samir Roy, Udit Chakraborty, "Introduction to Sift Computing: Neuro Fuzzy & Genetic Algorithms, Pearson Publications.
4. S.N.Sivanandam, S.Sumathi, S.N.Deepa, "Introduction to neural networks using MATLAB 6.0, TMH, 2008 Edition.

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VI SEMESTER

S214 - ELECTRICAL ENGINEERING MATERIALS

Pre-requisite course: Engineering Physics

COURSE OBJECTIVES:

Advances in technology depend on the availability of high performance materials. Critical selection of such materials for advanced engineering applications in high technology areas such as energy and communications is of utmost importance. The course contents comprise of a carefully chosen set of topics covering non renewable and renewable energy technologies, electronic materials, bio materials, nano materials etc. and a comprehensive understanding of their structure, processing and applications for engineering design.

Course Outcomes:

After completion of the course, students will be able to

CO1 Understand the properties of materials used in electrical devices.
CO2 Realize and apply knowledge of materials in different Engineering Applications.
CO3 Acquire knowledge about insulating materials and dielectrics.
CO4 Understand the synthesis and application of Nano materials and NTS products.

UNIT – I Electrical Properties and Conducting Materials

Classification of materials on the basis of energy gap, Mechanism of electrical conduction, factors affecting electrical conductivity, thermoelectric properties,
Characteristics, properties and examples of high voltage conducting materials, high and low resistance materials, contact fuse and fuse materials. Conductors, cable & wire materials, solder, sheathing, and sealing materials, electrical properties of these materials.

UNIT –II Dielectrics& Insulators

Dielectrics: Dielectric polarization under static fields - electronic, ionic and dipolar polarizations - behavior of dielectrics in alternating fields - mechanism of breakdown in gases, liquids and solids- factors influencing dielectric strength- capacitor materials-Ferro and piezo electricity
Insulating materials: insulator materials used - inorganic materials (mica, glass, porcelain, asbestos) - organic materials (paper, rubber, cotton silk fiber, wood,
plastics, bakelite) - resins and varnishes - liquid insulators(transformer oil) - gaseous insulators (air, SF6, and hydrogen) – ageing of insulators, Ceramics.

UNIT – III Materials for electronic components

Resistors –insulated moulded resistors-Cracked carbon resistors-alloy resistors-metallic oxide thin film resistors-High value resistors-wire wound resistors-non linear resistors – varistors – capacitors-mica- dielectric capacitors-glass-dielectric capacitors-plastic-dielectric capacitors etc – inductors –air cored coils –ferrite core-relays-

UNIT – IV Optical and Optoelectronic Materials:

Optical properties, , principles of photoconductivity, effect of impurities, principles of luminescence, types; LED materials, photo electronic materials, effect of composition on band gap, LCD materials, photo detectors, application of photo electronic materials.

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UNIT – V NANO MATERIALS & MEMS

Introduction – synthesis of nano materials, plasma arcing, chemical vapor deposition, solgels, electro deposition, ball milling, properties of nano materials, carbon nano tubes, types and structure of CNT, Fabrication of CNTs: Electric arc discharge Method, pulsed laser deposition, chemical vapor deposition, properties and applications.

Materials required for power generation from renewable sources and storage systems-Solar Cells, wind, fuel cells & micro turbines

TEXT BOOKS

1. Dekker Adrianus J, "Electrical Engineering Materials", PHI..
2. Kapoor P.L., "Electrical Engineering Materials", Khanna Publishers.

REFERENCES

1. R.K. Rajput, "Electrical Engineering Materials", Lakshmi publications
2. Rangwala.S.C., "Engineering Materials", Charotar Publishning House Pvt.Ltd, Gujarat,2011.
3. R.Balasubramaniam, "Callisters Materials Science and Engineering", Wily India(p)Ltd., 2010.
4. S.O.Kasap, "Principles of Electrical Engineering Materials", MGH.
5. Allison, "Electronic Engineering Materials and Devices" TMH.
6. Indulkar C.S.& Thiruvengadam S, "An introduction to Electrical Engineering Materials", S.Chand& co.
7. Tasneem Abbasi, S.A.Abbasi, "Renewable Energy Sources – Their Impact on Global Warming and Pollution" , PHI (Pvt.Ltd.), New Delhi

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S104 - ADVANCED CONTROL SYSTEMS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

STATE VARIABLE ANALYSIS

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation – controllability and observability - Pole Placement – State observer Design of Control Systems with observers.

UNIT – II

PHASE PLANE ANALYSIS

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

UNIT – III

DESCRIBING FUNCTION ANALYSIS

Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – Conditions for stability – Stability of oscillations.

UNIT – IV

STABILITY ANALYSIS

Introduction – Liapunov's stability concept – Liapunov's direct method – Lure's transformation – Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion.

UNIT – V

OPTIMAL CONTROL

Introduction -Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design. Introduction to adaptive and robust controls

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 6th Edition, 2003.
2. Ashish Tewari, 'Modern control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.

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REFERENCES

1. Jinzhi Wang, Zhisheng Duan, Ying Yang, Lin Huang, "Analysis and Control of Nonlinear Systems with Stationary sets-Time domain and Frequency domain methods", World Science publishing co.Pvt Ltd, 2009.
2. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 2006.
3. M.Gopal, Modern control system theory, New Age International Publishers, 3rd Edition 2014.
4. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, " Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition.2002.
5. Zhou, J.C. Doyle, K. Glover :Robust and Optimal Control, Prentice Hall, 1996.
6. J. Astrom and B. Wittenmark, Adaptive Control, 2nd Edition, Addison-Wesley, 1995

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S215 - ELECTRICAL MACHINE DESIGN

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

FUNDAMENTAL CONCEPTS

Major considerations and Limitations in Design – Materials for conductors, insulators, magnetic paths and resistors – Magnetic circuit calculations – Iron losses – Various leakage fluxes – Real and apparent flux densities – Leakage reactance calculation for transformers, Induction and synchronous machine – Thermal ratings: Continuous, Short time and Intermittent – Various cooling methods of electrical machines – Insulation classes –Different enclosures of rotating machines.

UNIT – II

D.C. MACHINES

Constructional details – Output equation - Choice of Specific loadings— Choice of number of poles-length of air gap- Armature core design –armature winding design-design of field poles and field coil – Design of Commutator and Brushes – Losses and efficiency calculations.

UNIT – III

TRANSFORMERS

Constructional details of core and shell type transformers – Amorphous Cores – output equation of single phase and three phase transformers – design of cores, windings –cooling of transformers – Design of tank with cooling tubes- no-load current calculation.

UNIT – IV

THREE PHASE INDUCTION MOTORS

Constructional details of squirrel cage and slip ring induction motors – Output equation — Choice of specific loadings – Main dimensions –stator winding, stator core, length of air gap, choice of rotor slots, design of squirrel cage and slip ring rotor – problems.

UNIT – V

SYNCHRONOUS MACHINES

Constructional details of cylindrical pole and salient pole alternators –Output equation – Choice of specific loadings – design of stator and rotor of cylindrical pole and salient pole machines -Short circuit ratio–length of air gap- armature design- – design of field coil.

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TEXT BOOKS

1. Sawhney, A.K., "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 6th Edition, 2010.
2. Agarwal, R.K., "Principles of ElectricalMachine Design", S.K.Kataria and Sons, 5th Edition, 2014.

REFERENCES

1. A.Nagoorkani, "A Simplified Text in Electrical Machine Design", RBA publications, 2nd edition, 2000
2. Mittle,V.N. and Mittle,A., "Design of Electrical Machines", Standard Publications and Distributors, 2002

LBRCE * EXAMINATION SECTION *

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S161 - COMMUNICATION PRINCIPLES AND SYSTEMS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Linear Modulation

Introduction to Electrical Communication System, Need for modulation, Classification of modulation schemes, Amplitude modulation: Definition, time domain and frequency domain representation, Single tone amplitude modulation, modulation index, power relations in AM waves, Generation of AM waves: Square law modulation, Envelope Detection of AM waves. Double side band suppressed carrier modulation (DSBSC): Definition, time domain and frequency domain representation, Generation of DSBSC waves: Balanced modulator, Coherent detection of DSBSC waves, Limitations of Coherent detection: Frequency error, Phase Error, Single side band (SSB) Modulation: Definition, Generation of SSB waves: phase discrimination method, Coherent detection of SSB waves.

UNIT – II

Angle modulation

Definition, types of angle modulation: Frequency modulation, Phase modulation, single tone frequency modulation, Narrow band FM (NBFM): time and frequency domain representation, Wide band FM (WBFM): time and frequency domain representation, Transmission bandwidth of FM, Generation of FM: direct method, indirect method. Detection of FM waves: Frequency discrimination method, Phase discrimination method.

UNIT – III

Pulse modulation

Sampling theorem for low pass signals, types of sampling, Pulse modulation: types of pulse modulation, Pulse amplitude modulation (PAM): definition, generation of PAM waves: Ideal, natural and flat top sampling. Demodulation of PAM waves, Pulse width modulation (PWM): Definition, generation of PWM, Demodulation of PWM waves, Pulse position modulation (PPM): Definition, generation of PPM, Demodulation of PPM, Multiplexing: Frequency division multiplexing, Time division multiplexing.

UNIT – IV

Digital modulation

Advantages of digital communication over analog communication, Quantization, Pulse Code Modulation system, Delta Modulation, drawbacks of delta modulation, Adaptive delta modulation, Amplitude Shift Keying, Frequency Shift Keying, Binary Phase Shift Keying, Comparison of various digital modulations.

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UNIT – V

Introduction to Data Communications & Networking

Introduction, Data Communication architecture, Data communication protocols, data communication standards, Layered network architecture, Data communication circuits: serial & parallel data transmission, data communication circuit arrangements, data communication networks, network models, network topologies, LAN, WAN & MAN. Open system interconnection model, TCP/IP model.

TEXT BOOKS

1. Simon Haykin, Communication Systems, Second Edition, John Wiley & Sons Publications, Singapore, 1983.
2. Wayne Tomasi, Introduction to Data Communications & Networking, LPE, Pearson Education,2009

REFERENCES

1. Herbert Taub , Donald L. Schilling, Principles of Communication Systems, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. Hwei, P. Hsu, Analog and Digital Communications, Schaum's Outlines, Second Edition, TMH Publiscations, 1991.
3. B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford University.
4. R.P.Singh, S.D.Sapre, Communication Systems (Analog & Digital), Second Edition, Tata McGraw-Hill Publications, 2009.

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S199 - DISTRIBUTED GENERATION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT –I

OVERVIEW OF DISTRIBUTED GENERATION

Distributed generation technologies-Solar Photovoltaic power-Wind power-Fuel cells-Micro turbines-Mini hydel power plants- **Goals of Distributed generation**-Reducing the electric utility bill-Improving system reliability-Improving payback of emergency-Selling power-Generating environmentally friendly power. Indian Scenario.

UNIT – II

SOLAR ENERGY

Solar radiation-Extraterrestrial radiation and solar constant-basic sun -earth angle-measurement of solar radiation data. Technologies for converting solar energy to electricity-**Solar Thermal**: Principles of applied heat transfer, solar thermal collectors: Glazing, evacuation, selective surfaces, concentrators. Solar thermal applications: water and space heating; solar ponds; dryers; distillation; solar cooker. Passive Solar design. **Solar Photovoltaic Systems**: Photovoltaic modules; module specifications; module hot spots; bypass diodes; PV arrays and PV systems; cabling; earthling and lightning protection. Battery storage: Lead and Nickel cadmium batteries; Charge regulators; LVD circuit; Voltage and current Source Inverters. Tracking Systems; Maximum power point tracking.

UNIT – III

WIND ENERGY

Components of WECS-WECS schemes-Power obtained from wind-simple momentum theory-Power coefficient-Sabinin's theory-Aerodynamics of Wind turbine. HAWT-VAWT-Power developed-Thrust-Efficiency-Rotor selection-Rotor design considerations-Tip speed ratio-No. of Blades-Blade profile-Power Regulation-yaw control-Pitch angle control-stall control-Schemes for maximum power extraction.

UNIT- IV

WIND POWER GENERATING SYSTEMS

Constant speed constant frequency systems-Choice of Generators-Deciding factors-Synchronous Generator-Squirrel Cage Induction Generator-Model of Wind Speed- Model wind turbine rotor - Drive Train model-Generator model for Steady state and Transient stability analysis. Need of variable speed systems-Power-wind speed characteristics-Variable speed constant frequency systems synchronous generator- DFIG- PMSG -Variable speed generators modeling - Variable speed variable frequency schemes. Stand alone and Grid Connected WECS system-Grid connection Issues-Machine side & Grid side controllers-WECS in various countries. Wind storage facilities.

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UNIT – V

FUEL CELLS, MICRO TURBINES & MINI HYDEL PLANTS

Fuel cell – components - Fuel Processor - Fuel cell - Anode Electrolyte - Fuel cell state - Power converter operation – Electrolysis - Combined heat and power - Operational Advantages - Fuel cell storage. **Micro turbines** – Introduction – components - operation: Grid connected and stand alone - shut down procedures. **Small hydro power plants** - Merits and demerits of small hydro power sources - Components of small hydro power plant - Technologies available - Potential of small hydro in India.

TEXT BOOKS

1. Gregory W. Massey. "Essentials of Distributed Generation Systems", Jones & Bartlett learning, 1st Edition.
2. Godfrey Boyle, "Renewable Energy Power for a Sustainable Future", Oxford University Press, 3rd Edition.

REFERENCES

1. John Twidell & Tony Weir, " Renewable Energy Sources",2/e, Taylor & Francis.
2. Ahmad Hemami, "Wind Turbine Technology", First Indian Edition, 2012, Cengage Learning.
3. Tasneem Abbasi, S.A Abbasi, "Renewable Energy Sources- Their Impact on Global Warming and Pollution" PHI Learning, 2010.

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S261 - HIGH VOLTAGE ENGINEERING

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTRODUCTION

Electric Field Stresses–Gas/Vaccum as Insulator–Liquid Dielectrics–Solids and Composites, Estimation and Control of Electric Stress–Numerical methods for electric field computation, Surge voltages, their distribution and control–Conduction and Breakdown in Gases– Gases as insulating medium – Ionization process–Townsend's criteria for breakdown–Paschen's law.

UNIT – II

BREAK DOWN IN LIQUID DIELECTRICS

Liquid as Insulator– pure and commercial liquids–conduction and breakdown in pure liquids and conduction and breakdown in commercial liquids–Break Down in Solid Dielectrics – Intrinsic breakdown–electromechanical breakdown–thermal breakdown–breakdown of solid dielectrics in practice–Breakdown in composite dielectrics–solid dielectrics used in practice.

UNIT – III

GENERATION OF HIGH VOLTAGES, CURRENTS AND TESTING

Generation of High DC Voltages–Generation of High AC voltages–Generation of Impulse Voltages–Generation of Impulse currents–Tripping and control of impulse generators. Testing of Insulators and bushings–Testing of Isolators and circuit breakers–Testing of cables–Testing of Transformers–Testing of Surge Arresters–Radio Interference measurements. Short circuit testing.

UNIT – IV

MEASUREMENT OF HIGH VOLTAGES AND CURRENTS

Measurement of High DC voltages–Measurement of High AC and impulse voltages Measurement of High DC, AC and Impulse currents–Oscilloscope for impulse voltage and current measurements.

UNIT – V

INSULATION CO-ORDINATION AND GROUNDING OF EHV SYSTEMS

Principles of Insulation Coordination on High voltage and Extra High Voltage power systems, Generalised Grounding systems, Grounding Grids.

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TEXT BOOKS

1. E.Kuffel, W.S.Zaengl, J.Kuffel, High Voltage Engineering, Elsevier Publications, 2nd Edition.
2. M.S.Naidu and V. Kamaraju High Voltage Engineering, TMH Publication, 3nd Edition.

REFERENCES

1. C.L.Wadhwa, High Voltage Engineering, New Age Internationals (P) Limited, 3rd Edition.
2. Ravindra Arora, Wolfgang Mosch, High Voltage Insulation Engineering, New Age International (P) Limited, 3rd Edition.

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L161 - MICROPROCESSORS AND MICROCONTROLLERS LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

LIST OF EXPERIMENTS
(Minimum 12 experiments has to be conducted)

Part I: 8086 Programs

1. Data Transfer Operations (MOV & XCHG)
2. Arithmetical Operations (ADD,ADC,SUB,SBB,DAA,AAA)
3. Logical Operations (AND,OR,XOR,Shift, Rotate)
4. String Operations
5. Sorting (Ascending & Descending Order)
6. Code Conversion Programs
7. String Comparison (PASSWORD CHECKING)
8. Read a Character and Display using MASM
9. Reverse the String using MASM

Part II: 8086 Interfacing

10. Key board Interfacing
11. Display Interfacing
12. Stepper motor Interfacing
13. DAC Interfacing (Sine, Square, Saw tooth, Triangular)
14. ADC Interfacing
15. 8259 Interrupt Controller

Part III: 8051 Programs

16. Arithmetical Operations
17. Logical Operations
18. Bit manipulation Operations
19. Parallel Port
20. Timers and Interrupts

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L169 - POWER ELECTRONICS LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

LIST OF EXPERIMENTS

1. Characteristics of SCR, IGBT & Power MOSFET.
2. Analysis of Single phase AC voltage controller with R & RL Loads.
3. Analysis of Single phase fully controlled bridge converter With R & RL Loads.
4. Analysis of Single phase IGBT inverter with R and R-L Loads.
5. Analysis of Three phase fully controlled bridge converter with R Load.
6. Analysis of Single phase dual converter with RL load.
7. Analysis of Four quadrant operation of chopper with R-load.
8. Analysis of PWM control of Boost converter with R and R-L loads.
9. Simulation of Single Phase ac to dc converter with LC filter in MATLAB.
10. Simulation of Single phase inverter with current controlled PWM technique in MATLAB.

ADDITIONAL EXPERIMENTS

11. Analysis of single phase cyclo converter with R and R-L load.
12. Simulation of Single phase fully controlled PWM rectifier with R & RL loads using PSCAD.
13. Generation of PWM pulses using micro controller kit.

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VII SEMESTER

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S270 - INDUSTRIAL MANAGEMENT

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT - I

Introduction: Management - Definition, Nature, Importance of management Functions of Management - Taylor's scientific management theory, Fayal's principles of management, Contribution of Elton mayo, Maslow, Herzberg, Douglas MC Gregor, basic concepts of Organisation- Authority, Responsibility Delegation of Authority, Span of control, Departmentation and Decentralization - Organisation structures (Line organization, Line and staff organization, Functional organization, Committee organization, Matrix organization)

UNIT - II

Operations Management: Plant location, Factors influencing location, Principles and types of plant layouts - Methods of production (job, batch and mass production), Work study - Basic procedure involved in method study and Work measurement

UNIT - III

Quality and materials management: Statistical quality control – Meaning- Variables and attributes - X chart, R Chart, C Chart, P Chart, (simple Problems) Acceptance sampling, Sampling plans, Deming's contribution to quality. Materials management – objectives, Need for inventory control, Purchase procedure, Store records, EOQ, ABC analysis, Stock levels

UNIT - IV

Human Resource management (HRM): Concepts of HRM, Basic functions of HR manager: Man power planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfers Separation, performance appraisal, Job evaluation and merit rating.

UNIT - V

Project management: Early techniques in project management - Network analysis: Programme evaluation and review technique (PERT), Critical path method (CPM), Identifying critical path, Probability of completing project within given time, Project cost analysis, project crashing (simple problems)

TEXT BOOK

1. Dr. A.R.Aryasri, Management Science, TMH, 4th edition, 2009

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LBRCE EXAMINATION SECTION

REFERENCES

1. Koontz & weihrich – Essentials of management, TMH, 8th edition, 2010
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004
3. O.P. Khana, Industrial engineering and Management
4. L.S.Srinath, PERT & CPM

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VII SEMESTER

S346 - POWER SYSTEM OPERATION AND CONTROL

Pre-requisite course: Power System Analysis

COURSE OBJECTIVES:
This subject deals with economic operation of power system, hydro-thermal scheduling and modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.
Course Outcomes:

After completion of the course, students will be able to
CO1 Understand the fundamental concepts of economic operation of power system.
CO2 Realize the operations of AGC and reactive power control.
CO3 Identify appropriate FACTS devices for power system applications.
CO4 Understand the fundamental concepts of de-regulation.

UNIT – I:ECONOMIC OPERATION
Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation without line losses, Optimum generation allocation including the effect of Transmission line losses – Loss Coefficients, General transmission line loss formula.

UNIT – II: UNIT COMMITMENT
Unit commitment problem, Priority order scheduling, Dynamic programming approach to Unit commitment problem , Hydro-Thermal coordination.

UNIT – III:AUTOMATIC GENERATION CONTROL (AGC)
Generator - Steady State and Transient Models, Description of Simplified Network Model of a Synchronous Machine (Classical Model), load, prime-mover and governor models, steady state performance of speed governing system, Primary load-frequency loop, steady state and dynamic response, with and without integral control loop, modelling and performance of secondary load-frequency loop, extension to two-area system, tie-line power flow model, interfacing AGC with economic dispatch.

UNIT – IV:REACTIVE POWER CONTROL AND VOLTAGE STABILITY
Reactive power flow and voltage collapse, V-Q sensitivity analysis, Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.
FACTS devices-Principle of operation, advantages, Types-STATCOM,TSSC,UPFC,IPFC

UNIT – V:DEREGULATION
Introduction of Market structure, Spot market, forward markets and settlements., Pricing, location marginal prices(LMP), Introduction to financial rights.

Dr.M.Uma Vani
Professor in EEE Department
L.B.R.C.E., Mylavaram
Krishna District, A.P. India
PIN-521 230

TEXT BOOKS

1. William D Stevenson Jr, "Elements of Power System Analysis", McGraw-Hill Series in Electrical & Computer Engineering, Fourth Edition, 1982.
2. P S R Murty, "Operation and Control in Power System", BS Publications, Second Edition, 2009.

REFERENCES

1. O.I. Elgerd, "Electric Energy Systems Theory: An Introduction", Tata McGraw-Hill Publications, 2nd Edition.
2. A.J. Wood and B.F. Wallenberg, "Power Generation, Operation and Control", John Wiley & sons Publications, 2nd Edition.
3. Hadi Saadat, "Power System Analysis", Tata McGraw-Hill Publications, 3rd Edition, 2011.
4. I.J.Nagrath & D.P.Kothari, "Modern Power System Analysis", Tata McGraw-Hill Publications, 3rd Edition, 2003.
5. N.D.Enrique Acha,et al. "Facts-Modelling and simulation in power networks", John wiley publications.

M. Uma Vani
Professor & Head, Department
L.B.R.C.E.
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S385 - SOLID STATE DRIVES

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

RECTIFIER CONTROLLED DC MOTOR DRIVES

Significance of variable speed drives-Controlled rectifiers circuits- Single-phase and three-phase, semi-fully controlled rectifier fed separately excited DC motors and DC series motors– continuous and discontinuous modes of operations – freewheeling diode operation-speed-torque characteristics, problems

UNIT – II

CHOPPER CONTROLLED DC MOTOR DRIVES

Principle of operation and control techniques – motoring operation of separately excited dc motor and dc series motor-regenerative braking, dynamic braking and plugging of separately excited dc motor and dc series motor - multi quadrant control of chopper fed dc motors, problems.

UNIT – III

CONTROL OF INDUCTION MOTOR DRIVES

stator voltage control-stator frequency control-Open loop V/f control -control of induction motor by ac voltage controller, voltage source inverter, current source inverter and cyclo converter- comparison of voltage source and current source inverter drives-problems

UNIT – IV

SLIP POWER CONTROLLED WOUND ROTOR INDUCTION MOTOR DRIVES

Static rotor resistance control-Slip-power recovery schemes- Static Scherbius and Static Kramer drive drive- Phasor diagram-Torque expression–closed loop speed control of static Scherbius drive-Modes of operation of Static Scherbius –applications, problems

UNIT – V

CONTROL OF SYNCHRONOUS MOTOR DRIVES

Synchronous motors– variable frequency control-operation of self controlled Synchronous motors-by VSI, CSI and Cyclo converters-Load commutated CSI fed Synchronous Motor, speed-torque characteristics, Closed Loop control operation of synchronous motor drives (Block Diagram Only)

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TEXT BOOKS

1. G K Dubey "Power Semiconductor Drives", Narosa Publications
2. B.K.Bose "Modern Power Electronics and AC Drives", PHI.

REFERENCES

1. Vedam Subramanyam "Thyristor Control of Electric drives", Tata McGraw Hill Publications
2. S K Pillai "A First course on Electrical Drives", New Age International(P) Ltd. 3rd Edition.

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S347 - POWER SYSTEM PROTECTION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

GENERAL INTRODUCTION TO POWER SYSTEM PROTECTION

Need for protective systems, nature and causes of faults, types of faults and their effects, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection. Classification of Protective Relays based on technology, function, Classification of protective schemes.

UNIT – II

OPERATING PRINCIPLES AND RELAY CONSTRUCTION

Electromagnetic relays - attracted armature, induction disc, Induction cup, permanent magnet, Moving coil, Moving iron, balanced beam relay, auxiliary relay. Thermal relays, Static relays – Merits and demerits of static relays, comparators-amplitude and phase, duality between amplitude and phase comparators, types of amplitude and phase comparators, micro processor based protective relays.

UNIT – III

PROTECTIVE SCHEMES

Over current protection: Time-Current characteristics- current and time settings Protection Schemes, Reverse power or directional relay, protection of feeders, ring mains, earth fault and phase fault protection.**Distance protection:** Impedance, reactance and MHO relays, input quantities for various types of distance relays, effect of arc resistance, power surges or power swings and line length on the performance of distance relays, selection of distance relays, distance relay characteristics. Choice of characteristics for different zones of protection.

AC Machines and bus zone protection: Generator protection – protection against stator and rotor faults and abnormal operating conditions such as unbalanced loading, loss of excitation, over speeding. Generator - transformer unit protection. Transformer protection - types of faults, over current protection, differential protection, differential relay with harmonic restraint, protection against high resistance ground faults, interturn faults. Bucholz relay.

UNIT – IV

MICROPROCESSOR BASED PROTECTIVE RELAYS

Over current, distance (Impedance and Reactance) and directional relays. Generalized mathematical expression for distance relays, measurement of R & X.

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UNIT – V

CIRCUIT BREAKERS

Arc voltage, arc interruption theories, restriking and recovery voltages, resistance switching, current chopping, interruption of capacitive currents, classification of circuit breakers- oil, air blast, air break, SF_6. Operating mechanism, selection of circuit breakers, high voltage DC circuit breakers, rating of circuit breakers, testing of circuit breakers.

TEXT BOOKS

1. Badri Ram, D.N.Vishwakarma, 'Power System Protection and Switchgear' TMH publications 2nd Edition, 2011
2. T.S.Madhava Rao, 'Power system protection –Static relays with microprocessor applications' TMH publications 2nd Edition,2008

REFERENCES

1. C.R.Mason, 'Art and scince of protective relaying' Wiley publications, 1956
2. C.L.Wadhwa, "Electrical Power Systems", New Age international(P)Limited, Third Edition, 2004.
3. Sunil S. Rao, Switchgear Protection and Power Systems: Theory, Practice and Solved Problems – 11th Edition, Khanna Publishers, 1999.

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S419 - VLSI DESIGN

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

Pre requisite: MOS transistors, Digital Circuits, Computer organization

UNIT – I

IC fabrication Technology: Silicon semiconductor technology–wafer processing, oxidation, epitaxy, lithography ion implantation, and diffusion, the silicon gate process; NMOS fabrication, CMOS fabrication, BI-CMOS technology, Comparison between CMOS and bipolar technologies.
Electrical properties of MOS circuits: saturated, non saturated regions, threshold voltage, body effect, trans conductance, output conductance, figure of merit, pass transistor, NMOS inverter, pull up to pull down ratio ,alternative forms of pull up, MOS transistor circuits, scaling factors of MOS devices, CMOS inverter, latch up in CMOS circuits.

UNIT – II

VLSI Circuit Design Process: Design flow, MOS layers, Stick diagrams- NMOS design style, CMOS design style, lambda- based design rules, design rules for contact cuts, CMOS lambda based design rules, layout diagrams for NMOS and CMOS inverters and logic gates. Concepts of sheet resistance and standard unit of capacitance, area capacitance, inverter delays, rise time, fall time estimation, cascaded inverters of drivers, wiring capacitance and choice of layers.

UNIT – III

Subsystem Design: Sub system design flow, Adders- single bit adder schematic, adder/ sub tractor, carry look ahead adder, carry save adders, 4x4 array multiplier, modified Booth's multiplier, serial/parallel multiplier, Shifters- design of 4x4 barrel shifter, Parity generator using XOR gates, XNOR based Comparator circuit, Zero/One Detectors, synchronous up/down counters, registers.

UNIT – IV

System Design and Design Methods: CMOS design methods, design strategies-structured design strategies, hierarchy, regularity, modularity, locality; Design methods-behavioural synthesis, RTL synthesis, logic optimization; Structural to layout synthesis–placement and routing, an automatic placement example, layout synthesis.
Design Tools: Design capture tools-HDL design, schematic design, layout design, floor planning, chip composition; Design Verification Tools-Simulation-circuit level, timing, logic level, switch level, mixed mode simulators. Timing verifiers, network isomorphism, net list comparison, layout extraction, back annotation, design rule verification, pattern generation.

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UNIT – V

CMOS Testing: Need for testing- functionality tests, manufacturing tests, a walk through the test process, Manufacturing Test Principles-fault models, observability, controllability, fault coverage , automatic test pattern generation(ATPG) , Fault Grading and fault simulation, delay fault testing, statistical fault analysis, fault sampling ,

Design Strategies for Test: Design for testability, Ad-Hoc testing, scan based test techniques, self test techniques, IDDQ testing, Chip level Test Techniques- regular logic arrays, memories, random logic. System-level Test Techniques-boundary scan, Layout design for improved testability.

TEXT BOOKS

1. Kamran Eshraghian, Eshraghian Dougles and A.Pucknell, Essentials of VLSI circuits and systems, PHI Publishers, 2005.
2. Neil.H.E.Weste and Kamaran Eshraghian, Principles of CMOS VLSI Design (2/e), Pearson Education Publishers, 3rd Edition.

REFERENCES

1. John .P. Uyemura, Introduction to VLSI Circuits and Systems, JohnWiley Publishers.
2. Wayne Wolf, Modern VLSI Design (3/e), Pearson Education Publishers.
3. M.SZE, VLSI Technology,2nd Edition, TMH Publishers.

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S188 - DIGITAL CONTROL SYSTEMS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTRODUCTION

Examples of Digital control system , Block diagram of Digital Control System, Advantages and applications. Digital to Analog conversion and Analog to Digital conversion. Z-Transforms-Introduction, Linear difference equations, , Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms.

UNIT – II

Z-PLANE ANALYSIS OF DISCRETE-TIME CONTROL SYSTEM

Z-Transform method for solving difference equations, Pulse transform, pulse response, Block diagram analysis of sampled data systems.

UNIT – III

STATE SPACE ANALYSIS

State Space Representation of discrete time systems, Pulse Transfer Function, solving discrete time state space equations, State transition matrix and it's Properties ,Methods for Computation of State Transition Matrix, Discretization of continuous time state space equations

UNIT – IV

CONTROLLABILITY, OBSERVABILITY AND STABILITY

Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function. Stability Analysis-Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Stability Analysis- Jury stablility test, the Bilinear Transformation.

UNIT – V

DESIGN OF FEEDBACK CONTROLLER

Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS

1. B.C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition, 2007.
2. K. Ogata, Discrete Time Control Systems, Prentice Hall, 3rd Edition.

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REFERENCES

1. M. Gopal, Digital Control and State Variable Methods, Tata Mcgraw Hill, 2/e, 2003.
2. G. F. Franklin, J. D. Powell and M. L. Workman, Digital Control of Dynamic Systems,Addison Wesley, 1998, Pearson Education, Asia, 3/e, 2000.
3. K. J. Astroms and B.Wittenmark, Computer Controlled Systems - Theory and Design, Prentice Hall, 3/e,1997.

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S218 - ELECTRICAL POWER QUALITY

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

OVERVIEW OF POWER QUALITY

Power quality (PQ) problem, Voltage sag, Swell , Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, interruption overview of power quality phenomenon , Remedies to improve power quality, power quality monitoring.

UNIT – II

INTERRUPTIONS

Long Interruptions - Definition – Interruptions – Causes of long interruptions – Origin of interruptions – Limits for the interruptions frequency – Limits for the interruption duration. **Short Interruptions** - Definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT – III

VOLTAGE SAG ANALYSIS

Voltage sag magnitude – Monitoring - Theoretical calculations – Examples - Sag magnitude in non-radial systems, Voltage calculation in meshed systems, Voltage sag duration, Fault clearing time – Magnitude duration plots- Measurement of sag duration, Magnitude and Phase angle jumps for three phase unbalanced sags – Phase to phase fault – Single phase faults – Two phase to ground faults – High impedance fault – Meshed systems.

UNIT – IV

HARMONICS

Definition of harmonics, Harmonic number(h), odd and even order harmonics, harmonic phase rotation and phase angle relationship, causes of voltage and current harmonics, individual and total harmonic distortion, harmonic signatures.

Power Quality measurement devices: Harmonic Analyzers, Transient-disturbance analyzers, oscilloscopes, data loggers and chart recorders, true RMS meters.

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UNIT – V

MITIGATION OF INTERRUPTIONS AND VOLTAGE SAGS

Overview of mitigation methods – From fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, Improving equipment immunity, Different events and mitigation methods. System equipment interface – Voltage source converter, series voltage controller, Shunt voltage controller, combined shunt and series controller. Typical wiring and grounding problems.

TEXT BOOKS

1. Math H J Bollen, "Understanding Power Quality Problems: voltage sags and interruptions", Wiley-IEEE Press, 1999.
2. C. Sankaran, "Power Quality" CRC Press,Second Indian reprint 2011.

REFERENCES

1. Roger C Dugan, Surya Santoso, Mark F. McGranaghan, H. Wayne Beaty, "Electrical power systems quality", 3rd Edition.
2. Angelo Baggini, "Hand book of power quality", Wiley publications, 2008.
3. J. Arrillaga, N.R Watson, S.Chen, "Power System Quality Assessment", New York: Wiley,1999.

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S379 - SMART GRID

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTRODUCTION TO SMART GRID

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies on Smart Grid- Case study of Smart Grid

UNIT – II

SMART GRID TECHNOLOGIES: PART 1

Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT – III

SMART GRID TECHNOLOGIES: PART 2

Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT – IV

MICRO GRIDS AND DISTRIBUTED ENERGY RESOURCES

Concept of micro grid, need & applications of micro grid, formation of micro grid, Issues of interconnection, protection & control of micro grid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel cells, micro turbines, Captive power plants, Integration of renewable energy sources.

UNIT – V

POWER QUALITY MANAGEMENT IN SMART GRID

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit. Information and Communication Technology for Smart Grid-Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN).

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TEXT BOOKS

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response" CRC Press

REFERENCES

1. Peter S. Fox Penner, "Smart Power: Climate Changes, the Smart Grid, and the Future of Electric Utilities", Island Press; 1st edition 8 Jun 2010
2. S. Chowdhury, S. P. Chowdhury, P. Crossley, "Microgrids and Active Distribution Networks." Institution of Engineering and Technology, 30 Jun 2009
3. Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley Blackwell 19

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S168 - COMPUTER NETWORKS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction: Use of Computer Networks- Network Hardware- Network software-Reference models Example Networks- Network Standardization. Physical Layer: The theoretical basis for Data communication- Guided Transmission Media.

UNIT – II

Data link layer: design issues- framing, error detection and correction, CRC, Elementary data link protocols- Simplex, Stop&Wait protocols, Sliding window protocols-one-bit,go-back-n,selective repeat. Medium Access Control Sub layer: Channel allocation problem- multiple access protocols-ALOHA,CSMA protocols, token bus,token ring, Ethernet, Collision free protocols, Data link layer switching, Bridges, Bridge learning algorithms,bridges from 802.x to 802.y, Local internetworking,spaning Tree bridges, Remote bridges.

UNIT – III

Network layer: Network layer design issues- Routing algorithms- Shortest path, Flooding, Distance vector routing, Link State routing , Hierarchical Routing, Broadcast routing & Multicast Routing,ICMP,ARP,RARP,BOOTP,DHCP, Congestion control algorithms- Leaky Bucket, Toke Bucket,Quality of service, Internetworking- network layer in the Internet.

UNIT – IV

Transport layer: Transport service- Elements of transport protocols- Internet transport protocols: TCP & UDP, Flow control-Segments, TCP Timers.

UNIT – V

Application Layer: Domain Name System- Electronic Mail -the World Wide Web, Network Security.

TEXT BOOK

1. Andrews S. Tanenbaum; "Computer Networks"; Fourth Edition, PHI.

REFERENCES

1. William Stallings; "Data and Computer Communications"; seventh Edition, Pearson Education.
2. Behrouz A .Fourouzan; "TCP/IP Protocol Suite"; Fourth Edition, Tata-McGraw Hill.
3. James F.Kurose, Keith W.ROSS; "Computer Networking - A Top-Down Approach featuring the Internet"; Pearson Education.

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S295 - MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction to Managerial Economics: Economics – Definitions, Micro, Macro & Welfare economics – Managerial Economics - Definition, Nature and Scope of Managerial Economics, Limitations –Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Types of demand. Definition, Types Measurement and Significance & types of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand Forecasting

UNIT – II

Theory of Production and Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs. Laws of Returns, Internal and External Economies of Scale. **Cost Analysis:** Cost concepts, Cost & output relationship in short run & long run, Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)-Managerial Significance and limitations of BEA.

UNIT – III

Introduction to Markets & Pricing Policies:
Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, oligopoly - Price-Output Determination in case of Perfect Competition and Monopoly, Monopolistic competition. Objectives and Policies of Pricing-Methods of Pricing

UNIT – IV

Capital and Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Components of working capital & Factors determining the need of working capital. Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method, Profitability Index, Internal rate of return (simple problems)

UNIT – V

Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts with simple adjustments. **Financial Analysis through ratios:** Importance, types: Liquidity Ratios, Activity Ratios, Capital structure Ratios and Profitability ratios

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TEXT BOOK

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.

REFERENCES

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.
2. Ambrish Gupta,Financial Accounting for Management, Pearson Education, New Delhi.
3. Lipey &Chrystel, Economics, Oxford university Press.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson.

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S381 - SOFTWARE ENGINEERING

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction to software engineering: The evolving role of Software, software, changing nature of software, legacy software, software myths.
Software process: layered technology, process frame work, CMMI, process patterns, assessment, personal and team process models, process technology, product and process.

UNIT – II

Process models: Prescriptive models, water fall model, incremental, evolutionary and specialized process models, unified process.
Software engineering practice: communication practices, planning practices, modelling practices, construction practice and deployment.

UNIT – III

Requirements Engineering: A bridge to design and construction, RE tasks, initiating the RE process, Eliciting Requirements, developing use cases, building the analysis models, negotiating and validating requirements.
Building the analysis model: requirements analysis, analysis modelling approaches, data modelling concepts, OOA, scenario based modelling, flow rated modelling, class based modelling, creating a behaviour model.

UNIT – IV

Design Engineering: Design within the context of software engineering, design process and software quality, design concepts, design model, pattern based software design Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design.

UNIT – V

Testing Strategies: A strategic to software testing, strategic issues, test strategies for conventional software, object oriented software, validation testing, system testing, the art of debugging Testing tactics : software testing fundamentals, white box testing: basis path testing, control structure testing. Black box testing, OO testing methods

TEXT BOOK

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 6th edition, 2005.

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REFERENCES

1. Ian Sommerville, Software engineering, Pearson education, 8th edition, 2008.
2. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996.
3. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007.
4. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson education, second edition, 2001,1995, PHI.

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S324 - OBJECT ORIENTED PROGRAMMING THROUGH C++

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Overview of C++:
Object Oriented paradigms, Data abstraction/control abstartction, OOPS principles, Origin of C++, Sample C++ program, dynamic initialization of variables , *new* and *delete* operators,C++ keywords, General form of C++ program, Type casting, Introducing C++ classes,Difference between class and structure.

UNIT – II

Classes and Objects:
Defining Classes in C++, accessing class members, access specifiers(Public and Private),defining member functions, static data members, static member functions, friend functions, friend classes, inline functions, nested classes, passing objects to functions, returning objects, object assignment, Array of objects, Constructor and Destructors

UNIT – III

Inheritance:
Base-class access control, access specifier (Protected), scope rules, Inheriting Multiple Base classes, constructors, destructors &inheritance passing parameters to base class constructors. Virtual base class.
String class-Usage of standard library *string class* with example programs.

UNIT – IV

Polymorphism:
Pointers: Pointers to objects, 'this' Pointer, Pointers to derived types.
Operator Overloading: Overloading Unary Operators, and Overloading Binary Operators using friend functions, Function Overloading,
Virtual functions: Pure Virtual Functions, Abstract classes
Templates: Introduction, simple generic classes & generic function, simple example programs.STL-List, Vector, Array

UNIT – V

Files and Exception Handling:
Exception Handling: Fundamentals, exception handling options.
C++ I/O Systems Basics: C++ Streams, C++ Stream classes, Unformatted I/O Operations, Formatted I/O Operations, Formatting using Manipulators.
C++ File I/O: Introduction, Classes for file stream Operations, Opening and closing a file, detecting end-of-file.

TEXT BOOK

1. Herbert Schildt, The Complete Reference C++, Fourth Edition, Tata McGraw Hill.
2. Deitel & Deitel, C++ How to Program, Third Edition, Pearson Education.

REFERENCES

1. E.Balaguruswamy, Object Oriented Programming with C++, Third Edition, TMH.
2. Ashok N Kamthane, Object Oriented Programming with ANSI& Turbo C++.

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L119 - COMMUNICATION AND PRESENTATION SKILLS LAB

Practical	:	3 Period / Week	Internal Marks	:	25
			External Marks	:	50
Credits	:	2	External Examination	:	3 hrs.

The following course content is prescribed for the Communication and presentations Lab:

1. Vocabulary building – synonyms and antonyms, one-word substitutes, analogy, idioms and phrases, verbal & alphabet series.
2. Oral Presentations – JAM
3. Functional English - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
4. Group Discussion – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
5. Making power point presentations.
6. Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, practicing mock-interviews.
7. Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, letter-writing.
8. Reading comprehension – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, and critical reading.

Minimum Requirement:

The English Language Lab shall have two parts:

i. **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
ii. **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

i. P – IV Processor
   1. Speed – 2.8 GHZ
   2. RAM – 512 MB Minimum
   3. Hard Disk – 80 GB
ii. Headphones of High quality

Suggested Software:

- Glob arena's software,2002
- Young India's Clarity software,2005

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BOOKS RECOMMENDED:

1. Stephen Bailey , "Academic Writing- A Practical guide for students", Rontledge Falmer, London & New York, 2004.
2. Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, "English Language Communication : A Reader cum Lab Manual, Anuradha Publications, Chennai, ,1st edition,2006
3. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice, New Age International (P) Ltd., Publishers, New Delhi,2007
4. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup, ,15th edition,2010
5. IELTS series with CDs by Cambridge University Press.3rd Edition,2007

L170 - POWER SYSTEMS LAB

Pre-requisite course: Electrical Power Transmission, Power System Analysis

COURSE OBJECTIVES:

This lab course provides students with essential knowledge to enhance the theoretical concepts and analyze the power system problems using various software tools.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1 Identify and design protective schemes for various equipment used in Electrical Industry.
CO2 Simulate and analyze power system for stability studies.
CO3 Determine the performance of compensated and uncompensated transmission lines.
CO4 Apply the knowledge of renewable energy systems to practical applications.
CO5 Interpret the experimental results and correlate them with the practical power systems.

LIST OF EXPERIMENTS:

The following experiments are required to be conducted as compulsory experiments:

1. Determination of receiving end quantities and the line performance of a medium/long transmission line using MATLAB
2. Develop a program code to determine the bus admittance matrix by inspection method.
3. Power flow solution by Newton-Raphson method using MATLAB.
4. Determination of sequence components(Positive, Negative and Zero) of an alternator.
5. Transient analysis of a single machine infinite bus system.
6. Simulation of LG, LL, LLG and LLL faults on a simple power system using PSCAD/MATLAB.
7. Determination of steady state frequency error and frequency deviation response for an isolated power system.
8. Determination of a) steady state frequency error and change in tie-line power flow, b) frequency deviation response, for an interconnected power system..

In addition to the above eight experiments, atleast two from the following list are required to be conducted:

9. Plot V-I characteristics of solar panel at various levels of insulation.
10. Study the effect of temperature on solar cell.
11. Analysis of the effect of shading on Series-Parallel connection of solar panels.
12. Study the performance of a wind turbine system.
13. Study the speed-torque characteristics of DC motor driven by photovoltaic panel.
14. Determination of Earth resistance in humid and dry earth conditions.
15. Plot the swing curve for a simple 3 or 4-bus power system using MATLAB / PSCAD.
16. Over current protection using numerical relay.

Dr. M. Uma Vani
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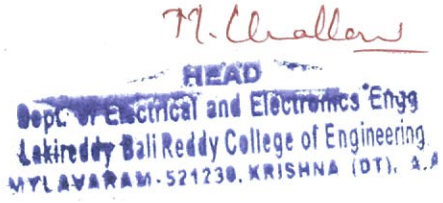
L.B.R.C.E., Mylavaram
Krishna District, A.P., India

VIII SEMESTER



S230 - ENERGY CONSERVATION AND AUDIT

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

INTRODUCTION

System approach and End use approach to efficient use of electricity; Electricity tariff types; Energy auditing; types and objectives- audit instruments-ECO assessment and Economic methods-specific energy analysis- Minimum energy paths- consumption models – Energy auditing of a typical industrial unit-case study.

UNIT – II

ENERGY EFFICIENT CONTROL STRATEGIES

Electric motors- Energy efficient controls and starting efficiency – motor efficiency and Load Analysis- Energy efficient/high efficient motors- Case study; Load matching and selection of motors. Variable speed drives; Pumps and Fans-Efficient Control Strategies-optimal selection and sizing – Optimal operation and storage-Case study. Transformer Loading / Efficiency analysis, feeder/cable loss evaluation-case study.

UNIT – III

REACTIVE POWER MANAGEMENT

Capacitor sizing-Degree of Compensation-Capacitor losses-Location-placement – Maintenance-case study; Peak Demand controls –Methodologies-Types of Industrial loads-Optimal load scheduling –case study.

UNIT – IV

ENERGY EFFICIENT LIGHTING SCHEMES

Lighting -energy efficient light sources-Energy conservation in Lighting Schemes-Electronic ballast –Power quality issues- Luminaries, case study.

UNIT – V

ENERGY CONSERVATION MEASURES

Cogeneration –Types and Schemes-Optimal operation of cogeneration plants-case study; Electric loads of Air conditioning & Refrigeration – Energy conservation measures- Cold storage, Types- Optimal operation –case study; Electric water heating- Gysers-Power Consumption in Compressors, Energy conservation measures ; Electrolytic Process; Computer Control- softwares-EMS.

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TEXT BOOKS

1. Giovanni and Petrecca –"Industrial Energy Management: Principles and Applications" , The Kluwer International series -207(1999).
2. Anthony J. Pansini, Kenneth D.Smalling –"Guide to Electric Load Management" , Pennwell Pub (1998).

REFERENCES

1. Howard E. Jordan –"Energy Efficient Electric Motors and their Applications", Plenum pub corp; 2nd ed. (1994).
2. Turner , Wayne C, Lilburn –"Energy Management Hand book" , The Fairmont press , 2001.
3. Albert Thumann –"Handbook of Energy Audits" , Fairmont Pr; 9th edition.
4. Recommended Practice for Energy Conservation and Cost Effective Planning in Industrial facilities, IEEE Bronze book, IEEE Inc USA.

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S263 - HVDC TRANSMISSION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

ECONOMICS & TERMINAL EQUIPMENT OF HVDC TRANSMISSION SYSTEMS
Types of HVDC Links – Schematics of HVDC Station – Comparison of AC &DC Transmission, Applications of DC Transmission and operating problems -Modern trends in D.C. Transmission, Ground return- advantages.

UNIT – II

CONVERTER THEORY AND PERFORMANCE
Valve characteristics, converter configuration, detailed analysis of 6-pulse converter, converter transformer rating, Multiple bridge converter, Numerical problems, current source converter, Multi terminal D.C (M.T.D.C) systems -types

UNIT – III

CONTROL OF HVDC SYSTEMS
Basic principle of control, Hierarchy of controls, control implementation, starting and stopping of dc links, converter control characteristics, converter firing angle control schemes-constant α-control, Inverse cosine control

UNIT – IV

CONVERTER FAULTS & PROTECTION
Converter fault types-D.C fault, A.C fault– protection against over-current and over-voltage in converter station – surge arresters –smoothing reactors – DC breakers, corona effects in dc lines and radio interference

UNIT – V

HARMONICS AND FILTERS
Generation of harmonics-A.C and D.C side Harmonics –Characteristic harmonics, Non-Characteristic harmonics, adverse effects of harmonics-Types of AC filters, D.C filters, design aspects of filters

TEXT BOOKS

1. K.R.Padiyar, "HVDC Power Transmissions Systems: Technology and System Interactions" , New Age International (P) Ltd., 2nd Revised edition, 2012
2. S Kamakshaiah, V Kamaraju, " HVDC Transmission", *TMH,* 1st edition

REFERENCES.

1. J Arrillaga, "High Voltage Direct current Transmission", Peter Peregrinus Ltd, UK
2. E.W.Kimbark, "Direct Current Transmission", Wiley-Interscience, New York

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S221 - ELECTRICAL TRACTIONS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

TRACTION SYSTEMS

Introduction, different systems of traction, systems of electric traction, systems of track electrification, comparison between DC and AC systems of railway electrification from the point of view of main line and suburban railway services.

UNIT – II

TRAIN MOVEMENT AND ENERGY CONSUMPTION

Introduction, typical speed-time curves, crest speed, average speed and schedule speed, factors affecting schedule speed, simplified speed-time curves, problems, mechanics of train movement, tractive effort for propulsion of train, power output from the driving axles, problems, factors affecting energy consumption.

UNIT – III

ELECTRIC TRACTION MOTORS

General features of traction motors, operating characteristics of dc motors, dc series motors, dc shunt motors, problems, ac series motors, three-phase induction motors, linear induction motors, applications, rating and ventilations.

UNIT – IV

CONTROL OF TRACTION MOTORS

Introduction, starting and speed control of dc traction motors, plain rheostatic starting, series-parallel starting, transition methods, drum controllers, contactor type controller, problems, buck and boost method of speed control, metadyne control, thyristor control of traction motors, speed control and starting of single-phase servo motors, three-phase induction motors.

UNIT – V

BRAKING, MECHANICAL CONSIDERATIONS & CONTROL EQUIPMENT

Braking, types of braking, mechanical regenerative braking, mechanical braking, hydraulic braking, magnetic track brakes, electro-mechanical drum brakes, eddy current brakes, mechanical considerations, control equipment, multiple unit control, auxiliary equipment, problems.

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TEXT BOOKS

1. Upadhayay J. & Mahindra S.N., "Electric Traction", Allied Publishers Ltd., 1st Edition.
2. J.B.Gupta, "Utilization of Electric Power & Electric Traction", S.K.Kataria & Sons.

REFERENCES

1. G.C.Gang, "Utilization of Electric Power & Electric Traction", Kanna Publishers.
2. Gopal K Dubey "Fundamentals of Electric Drives", Narosa Publishing.
3. Partab "Modern Electric Traction", Dhanpat Rai & Sons.
4. N.V.Surya Narayana, " Utilization of Electric power", New age international.

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S248 - FACTS CONTROLLERS

Prerequisite Course: Power Electronics

Course Objectives:

It deals with the basics of reactive power compensating techniques. It imparts students with the knowledge of power enhancement techniques of existing AC system with various FACTS devices.

Course Outcomes:

After completion of the course student will be able to:

CO1: Understand the concept and working principles of various FACTS devices.

CO2: Analyze various control schemes used for UPFC

CO3: Understand the steady state model of static voltage regulators

CO4: Choose appropriate FACTS controllers for power system applications.

UNIT – I

INTRODUCTION TO FACTS

FACTS Concepts: Transmission interconnections, power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT – II

SHUNT COMPENSATION

Principles of shunt compensation – Variable Impedance type & switching converter type-Static Synchronous Compensator (STATCOM) configuration, characteristics and control

UNIT – III

SERIES COMPENSATION

Principles of static series compensation using GCSC, TCSC, TSSC configurations, characteristics, control- applications

UNIT – IV

VOLTAGE REGULATORS

Principles of operation-Steady state model and characteristics of static voltage regulators and phase shifters- power circuit configurations.

UNIT – V

UNIFIED POWER FLOW CONTROLLER (UPFC)

Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control, Basic Control system for P and Q Control

TEXT BOOKS

1. N.G.Hingorani & L.Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press, 1999.
2. X.P. Zang, C. Rehtanz and B. Pal, "Flexible AC Transmission Systems: Modelling and Control", Birkhauser, 2006.

REFERENCES

1. Y. H. Song and A. T. Johns, "Flexible AC Transmission Systems", IET, 1999.
2. K.R.Padiyar," FACTS device", New Age International (P) Ltd, 4th Edition.
3. N.D.Enrique Acha,et al. "Facts-Modelling and simulation in power networks", John wiley publications

Dr.M.Uma Vani
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PIN 521 230

S196 - DISASTER MANAGEMENT

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

DEFINITIONS, TYPES & EFFECTS OF DISASTER

Introduction - inter disciplinary–nature of the subject - Definitions – types of Disasters-Relationship between Disaster and Human and Development- Disaster Management Cycle: Terminologies, Various disaster in India: drought, cyclone, extreme heat and cold, avalanche, collision of tectonic plates-volcano, mudflow and landslide, Industrial, Nuclear and Chemical disasters, Accident Related Disasters, Biological Disasters, Disasters Caused due to Social, Ethnic and Religious Conflicts, Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and air craft's accidents, High Power Committee on Disaster Management in India-Disaster Management Act 2005

UNIT – II

IMPACT OF DISASTERS

Introduction: life & livestock-habitation, agriculture & livelihood loss-health hazards-malnutrition problems-contamination of water-impact on children-environmental loss-assessment of Disaster Impacts using Modern Technologies.

UNIT – III

ROLE OF TECHNOLOGY IN DISASTER MANAGEMENTS

Disaster management for infra structures, taxonomy of infrastructure treatment plants and process facilities – electrical substations – roads and bridges – mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment – multimedia technology in disaster risk management and training – transformable indigenous knowledge in disaster reduction.

UNIT – IV

RESPONDING TO DISASTERS

PLANNING & RISK PREVENTION: Planning, early warning system-crisis intervention and management-Response and Rehabilitation after Disasters-temporary shelter – food and nutrition-safe drinking water –rehabilitation after cyclones- respond to drought response to river erosion-response after earth quake-response after Tsunami- Hunger and Disaster.

EDUCATION AND COMMUNITY PREPAREDNESS: Education in disaster risk reduction – Essentials of school disaster education – community capacity and disaster resilience – Community based disaster recovery - Community based disaster management and social capital – Designing resilience – building community capacity for action

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UNIT – V

OTHER ISSUES

Impact of disaster on poverty and deprivation - Climate change adaptation and human health – Exposure, health hazards and environmental capacity in disaster management - the red cross and red crescent movement - Corporate sector and disaster risk reduction - A community focused approach Casestudies.

TEXT BOOKS

1. Disaster Management – Future Challenges and Opportunities edited by Jagbir Singh, IK International Publishing, 2007
2. Ghosh G.K , "Disaster Management", APH Publishing Corporation, 2006.

REFERENCES

1. Carter, W. N. "Disaster Management: A Disaster Management Handbook", Asian Development Bank, Bangkok, 1991.
2. Chakrabarty, U. K "Industrial Disaster Management and Emergency Response", Asian Books Pvt. Ltd., New Delhi 2007.
3. Disaster Management edited by H K Gupta edited, Universities Press, 2003
4. Government of India website on Disaster Management: www.ndmindia.nic.in

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S373 - ROBOTICS AND AUTOMATION

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

AUTOMATION
Introduction, Types and strategies of automation, pneumatic and hydraulic components circuits. Automated Material Handling : Types of equipment, functions, analysis and design of material handling systems, conveyor systems, Automated guided vehicle system

UNIT – II

ROBOTICS
Introduction - Basic concepts – Robot anatomy –Components of robots- Robot motions – Number of D.O.F – Work volume – Classification of robots by control method – Specifications of robots.

UNIT – III

ACTUATORS
Pneumatic, Hydraulic Actuators, Stepper Motor Control Circuits.
END EFFECTORS: Introduction – Types of end effectors – Mechanical grippers – Vacuum cups, magnetic grippers, adhesive gripers and others – Robot / End effectors interface – Considerations in gripper selection and design

UNIT – IV

ROBOT PROGRAMMING
Methods of robot programming – Lead through method.-Textual robot languages – Generations of programming languages – Robot language structure – Motion commands – End effector and sensor commands – VAL II programming language.

UNIT – V

SENSORS
Acoustic, Optic, Pneumatic, Force/torque, optical encoders- Machine vision
ROBOT APPLICATION: Robots in Manufacturing and Non-Manufacturing applications – Future applications.

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TEXT BOOK

1. Mikell P.Groover,"Automation, Production systems and computer Integrated Manufacturing", Prentice Hall of India Private Limited,New Delhi.
2. Mikell P.Groover, MITCHELL WEISS, ROGER N. Nagel& NICHOLAS G. Odrey; Industrial Robotics, McGraw- HILL International Editions.
3. R.K.Mittal and IJ Nagrath, Robotics and Control ,Tata Mc Graw – Hill publishing company Limited, New Delhi.

REFERENCES

1. P. Radhakrishnan.S.Subramanyan,V.Raju," CAD/ CAM / CIM",New age international publishers
2. Robert J.Schilling, Fundamentals of robotics analysis & control, PHI learning private limited, New Delhi
3. Saeed B.Niku, Introduction to robotics analysis systems Application, PHI learning private limited, New Delhi
4. K.S.Fu, R.C Gonzalez and C.S.G.Lee, Robotics control, Sensing, vision, and intelligence; Mc Graw HILL International Editions
5. Richard D.Klafter, Thomus A. Chmielewski, Michael Negin, " Robotic Engineering – An integrated approach", Prentic Hall India Private ltd, New Delhi

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S357 - PROJECT MANAGEMENT

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

Pre Requisite: Industrial management,

UNIT – I

INTRODUCTION TO PROJECT MANAGEMENT
Definition, functions, evolution of Project Management, classification of projects, Project Management in different environments
The Project Management Systems, Methodologies & Systems Development Cycle: Systems approach, systems analysis, systems development, project feasibility, project life cycle, project appraisal, project contracting, the phases of systems development cycle.

UNIT – II

PROJECT FEASIBILITY STUDY
Developing a project plan, market & technical analysis, financial analysis, evaluation of project proposals, risk analysis, sensitivity analysis, social cost benefit analysis; Project Planning: Planning fundamentals, project master plan, work breakdown structure & other tools of project planning, work packages project organization structure & responsibilities.

UNIT – III

PROJECT SCHEDULING
Use of Gantt Charts & network diagrams, activity of node diagrams, activity on arrow diagrams, the critical path, time based networks PERT, CPM, Resource Allocation & GERT: Tools & techniques for scheduling development, crashing of networks, time cost relationship, resource leveling multiple project scheduling, GERT

UNIT – IV

COST ESTIMATING & BUDGETING
Cost estimating process elements of budgeting, project cost accounting & management information systems, cost schedules & forecast

UNIT – V

MANAGING RISKS IN PROJECTS
Risk concept & identification, risk assessment, risk priority, risk response planning, risk management methods; Project Control: Information monitoring, internal & external project control, cost accounting systems for project control, control process, performance analysis, variance limits, and issues in project control.

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TEXT BOOK

1. Nicholas, John M., "Project Management for Business & Technology (Principles & Practice)", Pearson Education

REFERENCES

1. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Implementation & Review", 7th edition, Tata McGraw Hill 2009.
2. Shtub, Bard and Globerson, "PROJECT MANAGEMENT, Engineering, Technology and Implementation", Prentice Hall, India
3. P.K.JOY, "Total Project Management, the Indian Context", Macmillan India Ltd. N.J.Smith(Ed), "Project Management", Blackwell Publishing, 2002.

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S180 - DATABASE MANAGEMENT SYSTEMS

Lecture	:	4 Periods / Week	Internal Marks	:	25
Tutorial	:	1 Period / Week	External Marks	:	75
Credits	:	3	External Examination	:	3 hrs.

UNIT – I

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

UNIT – II

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra.

Introduction to SQL: Characteristics of SQL, Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL.

UNIT – III

Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

UNIT – IV

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, log based recovery, checkpoints, ARIESalgorithm,deadlock handling.**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Recovery with concurrent transactions.

UNIT – V

Storage and Indexing: RAID levels, page formats, record formats, file types and organization, ISAM, B-tree,B+-tree.

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TEXT BOOK

1. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
2. Elmasri, Navathe, "Fundamentals Of Database Systems", Addision Wesley.

REFERENCES

1. Raghu Ramakrishnan, "Database Management System", McGraw Hill
2. Maheshwari Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi.
3. Date C J, "An Introduction To Database System", Addision Wesley.