Nirma University

School of Engineering

Institute of Technology

Electrical Engineering Department

B. Tech. In Electrical Engineering

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B. Tech. (All), Semester I
MA101: Calculus

[3 1 0 4]

Learning outcomes:

On completion of the course student

1 will be able to find higher ordered derivatives and hence represent function in power series of (x-a)

2 will apply the knowledge of function of several variables , its derivatives in engineering problems

3 will apply the knowledge of special functions(Gamma, Beta, Elliptic, Error) and its application in engineering problems

4 will apply the knowledge of multiple integration and its application in engineering problems

Syllabus:

Unit I: Differential Calculus Review of limits, continuity and differentiability, Successive differentiation, Leibnitz theorem (without proof), Indeterminate forms, Taylor's and Maclaurin's expansion of single variable, Partial Differentiation, Total derivative, Chain Rule, Implicit function, Euler's theorem and its applications, Taylor's and Maclaurin's expansion of function of several variables, Maxima and Minima of function of several variables, Lagrange's method of undetermined multipliers, Jacobian.

Unit II: Integral Calculus Review of proper and improper integrals, Reduction formulae, Beta-Gamma functions, Error function, Tracing of curves, Rectification, Quadrature, Volume of solid of revolution, Area of surface of revolution, Double integral and evaluation, Change of order of integration, Change of variable, Triple integral and evaluation, Area using double integration, Volume as double and triple integration, Volume of solid by double integration.

References:

1. Thomas' Calculus(Latest edition), Pearson publication.

2. G B Thomas and R. L. Finney, Calculus and Analytic Geometry (Latest edition), Narosa Publication, Delhi.

3. James Stewart, Calculus (Latest edition), Thomson Learning.

4. B. S. Grewal, Higher Engineering Mathematics, (Latest edition) Khanna publication, Delhi.

5. Dr. K. R. Kachot, Higher Engineering Mathematics Vol I (Latest edition), Mahajan Publication, Ahmedabad.

6. Sharma and Yeolekar, Engineering Mathematics Vol. I. (Latest edition), PHI, New Delhi.

NIRMA UNIVERSITY
Institute of Technology
Bachelor of Technology (All)
Semester II

L	T	P	C
3	1	0	4

Course Code	**2MA201**
Course Title	**Calculus and Differential Equations**

Course Learning Outcomes (CLO)

At the end of the course, students will be able to-

- apply differential and integral calculus to solve engineering problems,
- use power series to solve differential equations appears in engineering filed,
- deal with functions of several variables that are essential in engineering.

Syllabus:

Calculus **Teaching hours: 7**
Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions

Infinite Series **Teaching hours: 7**
Convergence of series, tests for convergence, power series, Taylor's and Maclaurin's series. Series for exponential, trigonometric and logarithmic functions

Multivariable Calculus: Differentiation **Teaching hours: 7**
Limit, continuity and partial derivatives, total derivative and chain rule, Euler's theorem, Taylor's series in two variables, Tangent plane and normal line, Maxima, minima and saddle points Method of Lagrange multipliers

Multivariable Calculus: Integration **Teaching hours: 9**
Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities).

Ordinary Differential Equations **Teaching hours: 10**
Second order linear differential equations with constant coefficients, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties

Partial Differential Equations: First Order **Teaching hours: 5**
First order partial differential equations, solutions of first order linear and non-linear PDEs

Tutorials
This shall consists of at least 8 tutorials (TA) based on the syllabus

Self-Study
Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1. G B Thomas and R L Finney, Calculus and Analytic geometry; Pearson
2. T Veerarajan, Engineering Mathematics; McGraw-Hill
3. B V Ramana, Higher Engineering Mathematics; McGraw-Hill
4. N P Bali and M Goyal, A text book of Engineering Mathematics; Laxmi Publications
5. B S Grewal, Higher Engineering Mathematics; Khanna Publishers
6. E Kreyszig, Advanced Engineering Mathematics; John Wiley & Sons
7. W E Boyce and R C DiPrima, Elementary Differential Equations and Boundary Value Problems; Wiley India
8. S L Ross, Differential Equations; Wiley India
9. E A Coddington, An Introduction to Ordinary Differential Equations; Prentice Hall India
10. E L Ince, Ordinary Differential Equations; Dover Publications
11. G F Simmons and S G Krantz, Differential Equations; McGraw Hill

L = Lecture, T = Tutorial, P = Practical, C = Credit

NIRMA UNIVERSITY

Institute of Technology

B Tech, All Branches

Semester-I/II

L	T	P	C
3	1	2	5

Course Code	**2CS101**
Course Title	**Computer Programming**

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. recognize the importance and apply C language constructs in program development,
2. analyse the problem and select the most appropriate method to solve it,
3. evaluate the correctness of the developed solution.

Syllabus:	**Teaching hours:**
Unit I Introduction to Computers: Introduction to Computers and the Internet in Industry and Research, The Internet and World Wide Web, web Resources, Hardware and Software, Computer Organization, Programming Languages, Introduction to the C Programming Language, Typical C Program Development Environment and steps. Test-Driving a C Application in Linux, Running a C program Using GNU for debugging.	5
Unit II Introduction to Programming: Memory Concepts, datatypes, operators and expressions, Decision Making, Bitwise Operators, Flowchart, Algorithms, Pseudocode, Test-cases, Repetition Statement, Counter-Controlled Repetition, Sentinel-Controlled Repetition, Nested Control Statements. Introduction some Simple C Program, I/O handling. Programming with C: keywords, syntax and library functions, datatypes, declarative, imperative and decision statements. Control structures.	9
Unit III Functions: Math Library Functions, User defined functions, Function Call Stack and Stack frames, Passing Arguments by Value and By Reference, Scope Rules, Recursion, Recursion vs. Iteration. Arrays: Defining Arrays, Sorting Arrays, Searching Arrays, Multidimensional Arrays, Variable-Length Arrays, Passing Arrays to Functions.	10
Unit IV Pointers: Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Pointers to Functions. Introduction to dynamic memory allocation. Characters and Strings: Fundamentals of Strings and Characters, Character-Handling	11

Library Functions, String-Conversion Functions, Standard Input/Output Library Functions for string, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library.

Unit V 10

Structures: Structure Definitions, Defining Variables of Structure Types, Operations That Can Be Performed on Structures, Initializing Structures, Accessing Structure Members, Using Structures with Functions

File Processing: Files and Streams, Creating a File, Reading and writing Data from a File.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Above concepts are to be implemented in C-language atleast with emphases on logic development and debugging, 10 experiments are to be carried out.

Tutorial Work:

The tutorial work will be based on the topics covered in the syllabus. Minimum 10 tutorials should be carried out.

Suggested Readings^:

- Deitel and Deitel , C How to Program, Pearson
- E. Balagurusamy, 'Programming in ANSI C", McGraw Hill
- Yashwant Kanitker, Let Us C, BPB Publications
- V. Rajaraman, Fundamentals of Computers, Prentice Hall of India
- Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
- David Gries, The Science of Programming, Springer
- Dromey R.G., How to solve it by computers, Prentice Hall of India
- Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
- Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
- Sedgewick R., Algorithms in C, Addison Wesley
- Schaum Ourline Series, Programming in C, , McGraw-Hill
- E. Balagurusamy, Pointer in C, McGraw Hill

L= Lecture, T= Tutorial, P= Practical, C= Credit

^This is not an exhaustive list

2EE102 ELECTRICAL WORKSHOP [0 0 2 1]

Course Outcomes (CO)

At the end of the, a student will be able to –

1. identify and propose appropriate electrical and electronic components for relevant applications,
2. select and make use of various laboratory equipment,
3. build simple domestic and industrial wiring systems,
4. apply basic maintenance and troubleshooting skills to house hold electrical appliances,
5. extend the awareness about safe practices in electrical systems.

Syllabus

Unit	Content	Teaching Hours
1	**Wiring Techniques** Designing of domestic and industrial wiring, selection of wire, load calculations	2 Entre
2	**Introduction to Electronic Components** Study of various electronic components like, power and signal diodes, zener diodes, BJTs, FETs, LED, LDR, Photo diode, Photo transistor, SMD components, general purpose ICs, use of bread board	4 Skill dev
3	**Lab Equipment** CRO, DC regulated power supply, function generator, multimeter, single-phase and three-phase auto-transformer (variac)	4 Skill dev
4	**Introduction to Electrical Components** Study of different types of switches, solid state and electromagnetic relays, contactors, rheostats, different types of capacitors, resistors, variable inductor (choke) etc.	4 Skill dev
5	**Soldering Techniques** Basics of soldering techniques, effectiveness of soldering and problem associated with soldering, general purpose board soldering	2 Skill dev, Entre
6	**Basics of Household Electrical Equipment** Rewiring / replacement of fuse, switch board layout, functioning of switch, fan regulator, tube light, electric iron, electric heater	4 Skill dev
7	**Electrical Safety and Protection** Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays	4 Skill Dev, employ
8	**Designing of Electrical Panel** Basic design steps and criteria, selection of various components, layout of panel, ferruling, crimping, lugging, annunciation, display, mimic, meter mounting etc.	4 Entre
9	**Introduction to DC Machine** Study of various parts of DC machine. Operation of DC machine as DC motor	2 Skill Dev

References

1. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta
2. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons
3. Sengupta R., Textbook of Principles and Reliable Soldering Techniques, New Age International (P) Ltd
4. B. L. Theraja, A. K. Theraja, Textbook of Electrical Technology Vol – III, S. Chand Publishers., New Delhi
5. K. B. Bhatia, Textbook of Fundamentals of Maintenance of Electrical Equipment Khanna Publishers
6. Er. Mehta S. D., Textbook of Electronic Product Design Vol – I, S. Chand Publishers., New Delhi
7. Dr. S. K. Bhattacharya, Dr. S. Chatterji, Textbook of Projects in Electrical, Electronics, Instrumentation and Computer Engineering, S. Chand Publishers., New Delhi
8. National Electrical Code: Bureau of Indian Standards, Govt. Of India, 2011
9. Operating Manuals of Various Equipment

ACADEMIC YEAR 2019-20

2EE101 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes (CO)

COs are clear statements of the expectations for student achievements in the course.
At the end of the course, a student will be able to –

- interpret the importance of electrical energy and relate its usage in various applications,
- illustrate the role of circuit elements in different system conditions,
- distinguish the operational aspects of ac-dc systems and comprehend the principles of electromechanical energy conversion,
- recognise the functions of electronic devices and basic circuits,
- apply the concepts of number based conversion and Boolean algebra for digital logic design.

Syllabus

Unit	Content	Teaching Hours
Unit - 1	**Review of dc Circuits** Kirchhoff's laws, solution of star-delta circuits, Joule's law of electric heating, relationship between various energy units, charging and discharging of capacitor, series-parallel magnetic circuits, fringing effect, comparison between electric and magnetic circuit, Concept of induced emfs, series-parallel connection of inductors, rise and decay of current in inductive circuit.	10 Skill Dev
Unit - 2	**Single-phase AC Circuits** Generation of alternatingemf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits.	08 Skill Dev
Unit - 3	**Three-phase AC Circuits** Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, power measurement in three-phase circuit, variation in wattmeter reading with power factor.	07 Skill Dev
Unit - 4	**Electromechanical Energy Conversion** Concept of electro-mechanical conversion, energy balance, elementary concept of electrical machines, types of rotating electrical machines.	04 Skill Dev
Unit - 5	**Analog Electronics** Half and full wave rectifiers, special purpose diodes, regulator, BJT and its applications, amplifier, oscillator, overview of opto-electronics devices, opto-couplers, transducers, Operational amplifier, Comparator, Timer IC and multivibrators.	08 Skill Dev
Unit - 6	**Digital Electronics** Number systems and its arithmetic, binary codes, Boolean-algebra & simplification of Boolean expression; logic gates, concept of universal logic; implementation of Boolean expressions using logic gates, application of digital circuits (e.g. adder, subtractor, multiplexer, de-multiplexer, analog to digital converter, digital to analog converter	08 Skill Dev

References

1. B.L.Theraja, A.K. Theraja, Textbook of Electrical Technology Volume I –, S. Chand & Co.
2. A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, Textbook of Basic Electrical

Engineering –TMH Publishing Co.

3. U. A. Patel, Textbook of Elements of Electrical Engineering, Mahajan Publishing House, Ahmedabad.
4. J. Nagrath, Basic Electrical Engineering, TMH Publishing Co. Ltd.
5. Vincent Del Toro, Textbook of Principles of Electrical Engg., Prentice Hall of India Pvt. Ltd., New Delhi.
6. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta.
7. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons.
8. Robert Boylestad, Louis Mashlsky, Electronics Devices and Circuit theory, Peerson
9. M. Morris Mano, Digital logic and computer Design, PHI

EE101 Elements of Electrical Engineering [3 0 2 4]

Learning Outcome:

The course is designed to introduce to a novice about the fundamentals of the electrical engineering. At the end of the course, it is expected that student will be able to express the behavior of basic electrical components like resistor, inductor and capacitor under DC and AC application. The students are exposed to single-phase and poly-phase systems and circuits and shall be able to comprehend the same. The student will be able to appreciate safety requirements and usage of safety devices. The learner will be able to understand and apply the basics of electrical engineering in their respective field of engineering.

Syllabus:

Skill Dev

Review of DC Circuits

Resistor, temperature effect on resistance, Kirchhoff's laws, solution of series-parallel and star-delta circuits, Joule's law of electric heating, relationship between various energy units, types of capacitor, charging and discharging of capacitor, fundamentals of magnetic circuits, fringing effect, series-parallel magnetic circuits, comparison between electric and magnetic circuit

Employability

Electromagnetic Induction

Faraday's laws of electromagnetic induction, concept of induced emfs, coefficient of coupling, series- parallel connection of inductors, rise and decay of current in inductive circuit, hysteresis and eddy current loss

Single-phase AC Circuits

Skill Dev

Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits

Skill Dev

Three-phase AC Circuits

Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, introduction to rotating vector, power measurement in three-phase circuit, solution of balanced and unbalanced systems

ENTRE

Domestic and Industrial Wiring

Basic domestic wiring methods, types of cable, accessories, PVC conduit and PVC casing, salient features of industrial wiring, consideration on cross sectional area and insulation strength based on voltage and current rating, design calculations, protective systems, Indian standard wiring practices

Skill, employa

Electrical Safety and Protection

Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays

Skill Dev

Batteries

Different types of batteries, need of batteries, charging and discharging of batteries, methods of charging

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

References:

1. Electrical Technology, Volume I – B.L.Theraja, A.K. Theraja; S. Chand & Co.
2. Basic Electrical Engineering – A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, TMH Publishing Co.
3. Elements of Electrical Engineering – U. A. Patel, Mahajan Publishing House, Ahmedabad.
4. Basic Electrical Engineering – I. J. Nagrath, TMH Publishing Co. Ltd.

   Principles of Electrical Engg.– Vincent Del Toro, Prentice Hall of India Pvt. Ltd., New Delhi.
5. Electric Wiring – Mr. S. Samaddar, New central book agency (P) Ltd., Calcutta.
6. Electrical Design Estimating and Costing – Surjit Singh, Dhanpat Rai & Sons.

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B. Tech Sem I - II (All Branches)
HM102, English (Foreign Language)

[2 0 2 3]

Course Learning Outcome:
By the end of this course

- Student will be able to understand and speak a new language
- Student will be more aware about the world outside
- It will add to the knowledge of culture other than their own
- Multi-Linguistic skills will equip them with better communication skills too

Syllabus of English Language:
The course content will encompass following topics

Grammar

- Tenses
- Helping and Modal auxiliary verb
- Concords
- Prepositions
- Idioms
- Synonyms –Antonyms
- Confusables

Prose

- Open Window by Saki
- A Cup of Tea by Katherine Mansfield
- The Piece of String by Guy De Maupassant
- Text of Steve Jobs' Commencement address -2005
- How to be an Alien by George Mikes

Poems

- Ode to the skylark – by P B Shelley
- Where The Mind Is Without Fear - by Rabindranath Tagore.
- The Road Not Taken- Robert Frost
- On The Move - by Thom Gunn.

Methodology:

Readings, exercises, role plays, videos will be the basic tools for teaching

As the course on foreign language will be offered by different experts, depending on the availability of the experts and demand, the syllabus of the offered foreign language will be approved by the Dean time-to-time before start of the every semester.

References:

1. Leech Geoffery and Svartik Jan, ‘A Communicative Grammar of English’, Pearson pub.
2. Murphy Raymond, ‘Grammar in Use Intermediate with Answers’, Cambridge University Press
3. Selected text in the form of handouts.Department of Mathematics & Humanities

(B. Tech. All Programmes)
(Semester I/II)

L	T	P	C
1	1	2	3

Course Code	**2HSI101/2HSB101**
Course Title	**English Communication**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. acquire adequate proficiency in English communication including reading and listening, comprehension, writing and speaking skills,
2. apply the dynamics of communication skills.

Syllabus:

Vocabulary Building **Teaching hours: 4 hrs (L)**	
Origin of English Language, Types of English, The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.	
Basic Writing Skills **Tutorial hours: 3 hrs (T)**	
Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.	
Identifying Common Errors in Writing **Teaching hours: 2 hrs (L), Tutorial hours: 2hrs (T)**	
Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Cliches.	
Nature and Style of sensible Writing **Teaching hours: 3hrs (L)**	
Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.	
Writing Practices **Tutorial hours: 4 hrs (T)**	
Comprehension, Precis Writing, Essay Writing, Idea Expansion.	
Oral Communication **Tutorial hours: 6 hrs (T)**	
Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm.	
Persuasive Communication **Teaching hours: 6 hrs (L)**	
Communication at Workplace: Report, Application and email writing, Referencing, Interviews, Formal Presentations.	
Laboratory Work	

Practices related to tenses, prepositions, word formation/transformation concord, affixes, one-word substitutes, idioms etc. Vocabulary building, Presentations and Group Discussions.

Self-Study

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

- Selected Texts and excerpts.
- Selected movies and TED talks
- King's Speech
- Babel
- Episodes of Yes Prime minister
- Episode of Sherlok
- Practical English Usage, Michael Swan, OUP. 1995.
- Remedial English Grammar, F.T. Wood, Macmillan. 2007
- On Writing Well, William Zinsser, Harper Resource Book. 2001.
- Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press. 2006.
- Communication Skills, Sanjay Kumar and PushpLata, Oxford University Press. 2011.
- Word Power Made Easy, Norman Lewis.
- Raymond Murphy, Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers, Cambridge University Press.
- Collins Academic Skills Vocabulary Organizer.
- Collins Writing Skills B2+.
- Real Life Real Listening-Collins.

NIRMA UNIVERSITY
Institute of Technology

Bachelor of Technology – All Programmes

Semester – I/II

L	T	P	C
1	1	-	2

Course Code	**2CL102**
Course Title	**Environmental Studies**

Course Learning Outcomes:

At the end of the course, students will be able to –

1. appraise the multidisciplinary nature of environment and sustainability
2. explain types of environmental pollution and its control measures
3. outline social issues related to environment

Syllabus: Teaching Hours: 15

Unit 1: Multidisciplinary Nature of Environment Hours: 04

Environment and its multidisciplinary nature, Ecosystems, biodiversity and its conservation, concept of sustainability, Environmental Impact Assessment, public awareness towards environmental conservation, Environmental legislation, carbon credit and carbon trading

Unit 2: Environmental Pollution, Global Warming and Climate Change Hours: 07

Types of environmental pollution and pollutants, causes, effects and control measures of – air pollution, water pollution, soil/land pollution, noise pollution, radioactive pollution. Role of an individual in prevention of pollution. Case studies on pollution, Effects – acid rain, ozone layer depletion and greenhouse effect. Sources, types and effects of waste, waste disposal and management, e-waste management

Unit 3: Social Issues related to Environment Hours: 04

Environment ethics- issues and solutions. Energy and water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns, environmental protection acts.

Self-Study:

The self-study contents will be declared at the commencement of semester.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 05 Assignments to be incorporated.

Suggested Readings:

- Dara, S. S., & Mishra, D. D. A textbook of Environmental Chemistry and Pollution Control. S. Chand & Company Ltd.
- Bharucha, E., Textbook of Environmental Studies, Universities Press.
- Dhameja, S. Environmental Studies. S. Kataria and Sons.
- Ristinen, R., & Kraushaar, J. Energy and the Environment, Wiley Publications.
- Masters, G. Introduction to Environmental Engineering and Science. Prentice-Hall Publications.
- Basak, A. Environmental Studies. Pearson Publications.

L= Lecture, T= Tutorial, P= Practical, C= Credit

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w.e.f. academic year 2018-19 and onwards

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B. Tech Sem I - II (All Branches)
HM111, French Language (Foreign Language)

[2 0 2 3]

Course Learning Outcomes:

At the end of the 40 hours course, students will be evaluated on the basis of 4 competences:

- Writing (Filling forms, post cards, small emails, messages),
- Speaking (To present oneself in details, to be able to ask questions in certain given situations, Role Play),
- Written Comprehension (Small texts, post cards, messages),
- Oral Comprehension (Understanding the basic day to day conversations).

Pedagogy: Communicative and Action Oriented Approach

Supplementary:
Cultural activities of Alliance Française d'Ahmedabad.

COURSE CURRICULUM

Main guidelines

1) To introduce oneself
2) To ask information about someone
3) To count
4) To communicate in a class
5) To Greet
6) To take leave
7) To ask personal information
8) To ask politely
9) To give personal information
10) To ask the price
11) To ask about likings
12) To express about our likings
13) To talk about a city
14) To name and find out different places in a city
15) To ask and give an explanation
16) To thank and to reply
17) To write a message
18) To give impressions about a place
19) To talk about ones' activities

20) To say where we live
21) To talk about the weather
22) To fix or postpone a meeting
23) To talk briefly about oneself

24) To ask the time and the timings
25) Telephonic conversation
26) To talk about the family
27) To talk about seasons
28) To understand simple information about the weather
29) To appreciate
30) To precise the quantities
31) With relevant vocabulary and grammar points.

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B. Tech Sem I - II (All Branches)
HM131, German Language (Foreign Language)

[2 0 2 3]

Course Learning Outcomes : On completion of the course, the student would be able to:

- understand & convey expressions associated with everyday routine and topics related to direct circumstances and common requirements in Germany (e.g. seeking and sharing personal information, handling simple conversations related to shopping, making reservations, ordering in restaurants, airports, banks, railway stations, universities and other all such public places).
- get an insight into the day-to-day socio-economic culture of Germany.
- appreciate a foreign culture and the importance of learning a foreign language.
- understand and put basic German grammar such as various types of verbs, nouns, adjectives, tenses and cases to practical & functional use.
- read, write, speak and understand elementary German and be able to hold simple, short conversations confidently.

Themes & Topics Covered:

1. German Greetings & Good-bye's
2. Introduction (Seeking introductions & introducing yourself thoroughly in German)
3. Orientation: Learning directions & interpreting city plans (Finding your way in the city, inquiring about places, communicating with localities, making basic conversations in Post Offices, Airports, Railway Stations & public places)
4. Learning Countries, States & Capitals
5. Professions
6. Making reservations: Hotels, Taxis & other such routine bookings
7. Placing order in Restaurants & learning to find your way around routine requirements
8. Learning time, dates, days of the week, numbers & occasions/festivals.

Grammar Covered:

Nouns- In depth study of nouns, with emphasis on case-specific changes

1. Verbs- Regular, Irregular, Helping, Separable & Modal verbs. All with their conjugations
2. Subjects- Nominative and accusative. Correlation between a subject & a verb
3. Cases- Nominative, accusative & dative. Effect of each on nouns & the corresponding changes
4. Articles- Definite & indefinite articles. Its impact & ultimate effect on cases

5. Sentences: Imperative, declarative, exclamatory & interrogative. Positive & negative sentence construction shall also be covered (e.g: “Ja”, “doch”, as well as “ nein”, “nicht” & “kein” respectively)
6. Concepts such as adjectives, possessive pronouns, prepositions & adverbsSentence Construction

NIRMA UNIVERSITY
Institute of Technology
Bachelor of Technology (All)

Semester I

L	T	P	C
3	1	0	4

Course Code	**2MA101**
Course Title	**Linear Algebra**

Course Learning Outcomes (CLO)

At the end of the course, students will able to-

1. acquire basic knowledge of matrix theory,
2. comprehend basic concept of vector space and linear transformation,
3. apply the knowledge of linear algebra in engineering problems.

Syllabus:

Matrix Theory **Teaching hours: 23**

Review of algebra of matrices, Rank of matrix, Inverse of matrix by Gauss-Jordan method, Solution of system of algebraic simultaneous equations, Linearly dependent and Linearly independent functions, Caley-Hamilton Theorem (without proof), eigen values and eigen vectors, Eigen values and eigen vectors of orthogonal, symmetric, skew-symmetric matrices, Hermitian matrix, skew-Hermitian matrix, Unitary matrix, Normal matrix, Algebraic and geometric multiplicity, Diagonalization, Spectral theorem for Real symmetric matrices, Application of quadratic forms.

Vector Space and Linear Transformation **Teaching hours: 22**

Definition of vector space, subspaces, linear combination, Linearly dependent and linearly independent vectors, Basis of vector space, Dimension, Rank-Nullity theorem (statement and verification by examples), Definition of linear transformation, types of linear transformations (Rotation, Reflection, Expansion, Contraction, Projection), Matrix of Linear transformations, Change of basis and similarity.

Tutorials

This shall consists of at least 8 tutorials (TA) based on the syllabus

Self-Study

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

- D C Lay, Linear Algebra and its Application; Pearson Publication
- E Kreyszig, Advanced Engineering Mathematics; John Wiley Publication
- H Anton, Elementary linear algebra with applications; John Wiley Publication
- K Hoffman and R Kunze, Linear Algebra; PHI Publication
- S Kumaresan, Linear algebra - A Geometric approach; PHI Publication
- J P Sharma and M Yeolekar, Engineering mathematics Vol-II; PHI Publication

L = Lecture, T = Tutorial, P = Practical, C = Credit

Nirma University
Institute of Technology
Bachelor of Technology
(A.Y. 2019 – 20)

L	T	P	C
0	0	2	1

Course Code	**2ME102**
Course Title	**Mechanical Workshop**

Course Learning Outcomes (CLO):
After successful completion of the course, students will be able to-

1. explain the safety measures required while working in the mechanical workshop,
2. interpret an engineering drawing for the given practice job,
3. select and make use of proper hand tools for a given job,
4. develop an understanding of various workshop practices.

Course Outline:

(a) Instruction / demonstration shall be given for each of the following shops/trades with regards to the materials, tools and equipment used: **10 hours**

1. Introduction to Mechanical Workshop Practice
2. Joining process
3. Plumbing
4. Fitting
5. Sheet metal work
6. Carpentry
7. Black smithy
8. Use of conventional and CNC machines

(b) Exercise and Term work: Each student is required to prepare a job in the following trades: **20 hours**

1. Arc Welding
2. Fitting
3. Carpentry

4. Black smithy

Suggested Readings:

- H S Bawa, Workshop Practice -I and II by, TMH Publication.
- K C John, Mechanical Workshop Practice by, PHI Publications.

L = Lecture, T = Tutorial, P = Practical, C = Credit

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Institute of Technology
Bachelor of Technology

L	T	P	C
2	1	2	4

Course Code	**2PY101**
Course Title	**Physics**

Course Outcomes (CO):

At the end of the course, students will be able to -

1.Acquire the knowledge of fundamental principles of physics and relate to the engineering science,

2.Apply the concepts of Physics for solving Engineering problems,

3.Relate principles of Physics for solving new and challenging problems of technology.

Syllabus:	**Teaching hours**: **30**
Physics of Nanomaterials: Introduction to Quantum Physics: Particle in a three dimensional box, Introduction – Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials – Electrical, Magnetic, Optical, Mechanical, Characterization techniques – X ray Diffraction (XRD) - Single Crystal, Powder and Laue techniques, Low energy Electron Diffraction (LEED), Scanning Electron Microscopy, Tunnelling Electron Microscopy, Nanostructures; Carbon nanotubes Characteristics and applications, Nanotechnology and environment.	06
Lasers and Holography: Introduction, Basics of Interaction of radiation with matter, Condition for light Amplification, Population inversion and metastable state, pumping, the principle pumping scheme: Three and Four level scheme, Construction and working of optical resonator, Optical amplifier, Applications of laser beam, Holography.	06
Introduction to Fiber Optics: Introduction of fiber-optic system, Principle and construction of fiber cable, Acceptance angle and numerical aperture, Types of Optical fiber: Based on material & based on mode of propagation, Index profile, Fiber optic communication link, Fiber optic sensor, Advantages of fiber optic system.	04
Nuclear and Plasma Physics: Introduction to nuclear physics, types of nuclear reactions, nuclear reaction cross sections, Radius of Gyration, particle accelerators – pinch of synchrotron radiation, nuclear fission as a source of energy, Nuclear radiation counters – Geiger Mullar Counter, scintillation counter. Basic concepts of Plasma physics: Introduction to Electrostatics and Electromagnetics, Curl, Divergence and Gradient of fields, Maxwell's equations, Motion of charged particle in E and B homogeneous field, Pinch effect, Magnetic	05

trapping of plasma, Van Allen radiation belt.

Physics of Vacuum Techniques and Cryogenics: Creation of vacuum with different pumps-rotary pump, diffusion pump, Measurement of vacuum with different gauges; Need of vacuum in Plasma unit, Cryogenics – use of liquid Nitrogen and liquid Helium, Applications of cryogenics in refrigeration, space and medical field	04
Engineering of Auditorium and Ultrasonics: Introduction, Defection due to reflection of sound, Sabine's empirical formula, Reverberation theory, Eyring's equation, Acoustical defects and their remedies, Acoustic materials, Ultrasonic waves, Piezoelectric method, Properties and application of ultrasonic waves	05

Laboratory Work:

A minimum of 10 experiments based on above syllabus will be arranged.

Self- Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1.M N Avadhnulu and P. Kshirsagar, A Text Book of Engineering Physics, S Chand.

2.T. Pradeep, Nano: The Essentials, New Central book Agency.

3.S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.

4.B. L. Theraja, Physics for Engineers, S Chand Publication

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CE101 **Art of Programming** **[3 1 2 5]**

Learning Outcome:

2Students will get acquainted with basic components and capabilities of a typical computing system.

- Students will be able to critically think about basic problems and develop algorithms to solve, validate and verify with computing systems.
- Students will be able to identify appropriate language constructs and approach to computational problems.
- Students will be acquainted with coding standards including documentation which are required to be used for the development of effective, efficient and maintainable programs.

Syllabus:

Introduction to Computer Systems: Basic computer organisation, operating system, editor, compiler, interpreter, loader, linker, program development.

Data Storage and Operations: Various data representation techniques, data types, constants, variables, arrays, various arithmetic and logical operations in a typical programming environment.

Algorithms and Flow charting: Introduction to computer problem solving, concepts and algorithms and flow chart, tracing of an algorithms.

Algorithm to Program : Specifications, top down development and stepwise refinement as per programming environment needs. Imperative style of correct and efficient programming, introductory concepts of time and space complexities.

Loops and Controls Construct : conditional and unconditional execution. Simple versus nested controls. Various aspects of repetitive executions, iterative versus recursive programming styles, assertions and loop invariants.

Errors and Debugging: Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory.

Structured Programming: Introduction to modular approach of problem solving, concepts of procedure and functions for effective programming.

Coding Conventions: Variable naming, function naming, indentation, usage and significance of comments for readability and program maintainability.

Laboratory Work:

Above concepts are to be implemented in any High Level Programming Language (preferably C-language) atleast 10 experiments are to be carried out.

References:

1. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning

2. Dromey R.G., How to solve it by computers, Prentice Hall of India
3. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
4. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
5. Sedgewick R., Algorithms in C, Addison Wesley
6. Yashwant Kanitker, Let Us C, BPB Publications
7. Schaum Ourline Series, Programming in C, , McGraw-Hill
8. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India

2CY101 Chemistry

At the end of the course, students will be able to –

1. relate the fundamentals and their application in various field of engineering,
2. identify and apply the principles of green chemistry in improving the existing technology,
3. categorize the materials on the basis of their properties,
4. select appropriate method of analysis and interpret its result.

	Syllabus	Teaching Hours
Unit 1	**Water and its Treatment** Introduction, Sources of water impurities, Hardness of water, Degree of hardness, Softening of water, Water treatment processes, Problems with boiler feed water and its treatments Specifications for drinking water (BIS standards)	**08**
Unit 2	**Fuel** Calorific Value, Types of fuel, Selection of fuels, Analysis of coal:- proximate and ultimate analysis, Flue gases:- Orsat apparatus, Alternative fuels:- Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Ethanol, Bio-diesel	**05**
Unit 3	**Lubricants** Classification and functions of lubricants, Properties:- lubricating oil and greases, Selection of lubricants	**04**
Unit 4	**Polymers and Composite materials** Introduction to Polymers and Polymerization, Elastomers, classification and uses, Biopolymers:-Cellulose and starch, Advanced polymeric materials, Composites:- Introduction, classification and applications	**05**
Unit 5	**Green Chemistry** Overview, Set of Principles of Green Chemistry, Industrial applications	**03**
Unit 6	**Engineering Materials** Adhesives:- characteristics, classification, and uses, Fullerenes:- structure, properties and applications, Nano rods:- brief introduction, Organic Electronic Materials:- introduction, types and applications, Liquid Crystals:- Introduction, classification and applications, Explosives:- Introduction, Classification, Characteristics, Disarmament, Weapons of Mass Destruction (WMD), peaceful uses of explosives	**04**

Unit 7	**Overview of electrochemical systems**	**01**

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

- P.C. Jain and Monika Jain, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
- Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
- S.S. Dara, Textbook of Engineering Chemistry, S. Chand and Company.
- Mike Lancaster, Green Chemistry: An Introductory Text, Royal Society of Chemistry.
- J.C. Kuriacose and J. Rajaram, Chemistry in Engineering and Technology, Tata Mc Graw Hill.
- Prasanta Rath, Engineering Chemistry, Cengage Learning.
- Sunita Rattan, A Textbook of Engineering Chemistry, S.K. Kataria & Sons.

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(A.Y. 2019 – 20)

L	T	P	C
2	0	4	4

Course Code	**2ME101**
Course Title	**Engineering Graphics**

Course Learning Outcomes (CLO):
After successful completion of the course, students will be able to-

1. explain the fundamental principles of engineering graphics and related drawing standards,
2. illustrate the various methods of producing and presenting graphic information,
3. make use of engineering graphics for communication using traditional means and the computer aided tools,
4. develop capability to visualize and represent geometry in two dimensions and in three dimensions,
5. summarize the role of engineering graphics in various engineering disciplines.

Syllabus: **Teaching hours: 30**

UNIT - I **02 hours**

Introduction to Engineering Drawing
Importance and applications of engineering drawing for various branches of engineering, drawing instruments, BIS Code of Practice, Lines, Lettering and Dimensioning, Scales, basic geometrical construction, Sheet Layout

UNIT-II **04 hours**

Engineering Curves
Construction of Conics by different methods, construction of cycloid, epicycloid and hypocycloid, construction of involutes, constructions of archimedean spiral and helix.

UNIT-III **14 hours**

Solid Geometry
Principle of Orthographic Projections, projections of points, projections of straight lines, projections of planes, projections of regular solids and sections of regular solids.

Developments of Surfaces
Development of lateral surfaces of regular solids (prism, pyramid, cone, cylinder) by parallel line method / radial line method.

UNIT-IV **05 hours**

Orthographic Projections
Conversion of pictorial views into orthographic projections including sectional orthographic projections.

Isometric Projections
Conversion of orthographic views into isometric projections / views.

UNIT-V **05 hours**

Computer Aided Drafting

Understanding of GUI (Graphical User Interface) of drafting software, demonstration of use of available Drawing Commands, Modifying / Editing commands, Annotation and Dimensioning Commands, Concepts of Layers, demonstration of various line styles and construction of drawings in soft form using drafting software.

Conventional representation

Symbols for standard machinery components such as nuts, bolts, locking devices, riveted and welded joints, foundation bolts. Symbols used in electrical, electronics and civil engineering

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus with equal emphasis on use of drafting software and drawing sheets.

Suggested Readings:

1. Bhatt, N. D., Engineering Drawing, Charotar publication
2. John, K. C. Engineering Graphics, PHI Publication.
3. Luzzader, W. J. and Duff, J. M. Fundamentals of Engineering Drawing, PHI publication.
4. Bethune, J. D. Engineering Graphics with AutoCAD®, PHI Publication.
5. IS SP 46: 2003. Engineering Drawing Practices for Schools and Colleges.

L = Lecture, T = Tutorial, P = Practical, C = Credit

NIRMA UNIVERSITY
Institute of Technology
Electrical Engineering Department
(Semester - I/II)

w.e.f.: Academic Year 2019-20

L	T	P	C
1	0	0	1

Course Code	2EE201
Course Title	Introduction to Electrical Engineering

Course Learning Outcomes:

At the end of the course, students will be able to -

- relate the importance of engineering in day to day life,
- exemplify the role of electrical engineering in other domains,
- interpret the opportunities and future trends of electrical engineering,
- recognize the role of electrical engineer in industry.

Syllabus	Teaching Hours
UNIT-1: About Engineering About engineering, history of engineering, social relevance of engineering, role of engineering in human life	1
UNIT-2: Introduction to Electrical Engineering Introduction to different domains of electrical engineering; electrical power system, power electronics, electrical machines, diversity of electrical engineering	3
UNIT-3: Aspects of Electrical Engineering Productivity, profitability, efficiency, safety, optimization, environmental concerns, societal needs, user friendliness	2
UNIT-4: Emerging Trends Electricity generation using renewable sources, distributed power generation, power quality, restructured power system, concept of smart grid, HVDC transmission, concept of electric vehicle	3
UNIT-5: Interdisciplinary Approach Need of electrical engineering in other branches of engineering, role of different branches of engineering in electrical engineering, different possibilities of interdisciplinary research and development, challenges and possible solutions	2
UNIT-6: Career Opportunities Role and responsibilities of Electrical Engineer in various verticals of industries like design industry, manufacturing industry, testing and maintenance industry, research and power sector, infrastructure development, transportation industry and military application	2
UNIT-7: Case Studies Interpreting the tenders, Role of Electrical Engineering in noteworthy industrial developments	2

Self-Study:

(1) Important milestones in the field of electrical engineering
(2) Contribution of different scientists – past and present

Suggested Readings:

1. Electrical India, magazine on power and electrical products industry
2. Literature from Bureau of Energy Efficiency (www.beeindia.gov.in), Ministry of Power, Government of India.
3. IEEE xplore digital library – ieeexplore.ieee.org
4. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpat Rai and Co.
5. Electrical Engineering related informative videos/movies
6. IEEE spectrum - spectrum.ieee.org

2ME305 Mechanics of Solids [3 1 2 5]

Course Learning Outcome:
After successful completion of the course, student will be able to

- describe force systems and to compute geometrical properties
- classify materials and characterise them
- analyse various structural elements subjected to different types of force systems
- compute stresses & strains for structural elements
- conduct experiment, infer and report outcomes

Syllabus:
Statics: Principles of statics, particle, rigid body, Coplanar, concurrent and non-concurrent parallel and non-parallel forces, composition and resolution of force, couples and their properties, combination of coplanar couple and forces, forces in truss, force in cable, rigid body assemblies, forces in space
Distributed forces: center of gravity, moment of inertia
Friction: Static and sliding friction, inclined plane friction, ladder friction, wedges, belt and rope friction
Principle of Virtual work
Strength and Elasticity: Stresses; Axial, normal, in-plane, tensile, compressive, shear, flexural, Thermal and hoop, complementary shear. Strain: Linear, shear, Lateral, Thermal and volumetric, Poission's ratio, Elastic constants and relation between them and bodies subjected to loads in three directions.
Shear force and Bending moment: Types of supports, support reactions, Bending moment and shear force diagrams in statically determinate beams subjected to different types of loading, Relation between bending moment, shear force and rate of loading
Stresses in beams: Theory of simple bending, bending stresses and their distribution, moment of resistance, modulus of section, composite beam sections, distribution of shear stress in different sections.
Torsion: Torsion of solid and hollow circular shafts, shear stress due to torsion, angle of twist, Torsional moment of resistance.
Principal Plane and stresses: Compound stresses, analysis of principal planes and principal stresses
Thin cylinder and spherical vessels under pressure
Mechanical Properties of Materials

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 11 experiments to be incorporated.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Meriam and Karaige, Engineering Mechanics: Static, Wiley-India.
2. R. C. Hibbler, Mechanics of Materials, Pearson.
3. Beer, Johnston and Dewolf, Mechanics of Materials, Tata McGraw-Hill Education.
4. H. J. Shah and S. B. Junnarkar, Mechanics of Structure Vol. I, Charotar Publishing House Pvt. Limited.

NIRMA UNIVERSITY
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B.Tech. in Electrical Engineering
Semester - III

L	T	P	C
3	0	0	3

Course Code	**2EE304**
Course Title	**Analog and Digital Electronics**

Course Learning Outcomes (CLO):
At the end of the course, students will be able to-
1. conceptualize and analyse different electronic circuits
2. select various components for electronic circuits
3. design analog-digital electronic circuits for various applications

Syllabus **Teaching Hours: 45**

Unit-1: Introduction **01**
Overview of analog and digital circuits, comparison between analog and digital circuits, their applications

Unit-2: Differential Amplifier **05**
Design of conventional CE amplifier, Evolution of differential amplifier from conventional amplifier, Input output characteristics of differential amplifier, differential amplifier circuit configurations, dc and ac analysis of dual input balanced output differential amplifier, current mirror and level translator

Unit-3: Operational Amplifier **05**
Equivalent circuit of op – amp, the ideal operational amplifier, Open loop op-amp configuration and its importance, concept of positive and negative feedback, op-amps with voltage series and voltage shunt negative feedback, Op-amp parameters, frequency response of op-amp

Unit-4: Op-amp Applications **07**
Adder, subtractor circuits using op-amp, integrator and differentiator using op-amp, ac and dc voltmeter using op-amp, basic comparator, zero crossing detectors, Schmitt trigger, window detector, precision rectifier and various circuits, instrumentation amplifier and its applications, various other applications using op-amp

Unit-5: Timer Circuits and Signal Generators **05**
IC 555 and its functions, astable, bistable and monostable circuits using IC 555, various applications of IC 555, IC 566 - VCO, IC 565 – PLL, IC – 9400 V/F and F/V – Pin Diagrams, functions, applications

Unit-6: Logic families **02**
Overview of different logic families and IC design technologies, RTL, I2L, ECL, TTL, CMOS, open collector gates

Unit-7: Karnaugh Map and Design of Combinational Circuits **06**

Expressions of Boolean function in SOP & POS forms, merging & minimization of SOP and POS forms, problems based on karnaugh Map, don't care combinations, QM method for solving Boolean expressions, design of half and full adder, half and full subtractor, BCD adders, code converters, parity bit generators and checkers, multiplexers, demultiplexers, decoders, encoders, their applications

Unit-8: Flip Flops & Design of Sequential Circuits **06**

S-R latch, edge triggered S-R flip flop, JK flip flop, D flip flop, T flip flop, flip flop operating characteristics, shift registers, controlled buffer register, data transmission in shift register, serial in serial out, parallel in parallel out shift register, serial in parallel out, parallel in serial out shift register, asynchronous up/down counters, synchronous up/down counters

Unit-9: Analog to Digital and Digital to Analog Converters **05**

Digital to analog conversion, R-2R ladder type DAC, weighted resistor type DAC, switched current source type DAC, analog to digital conversion, counter type ADC, tracking type ADC, successive approximation type ADC, flash type ADC

Unit-10: Memories and programmable logic devices **03**

Role of memory in computer system, memory types & terminology, types of ROM, Semiconductor RAM, memory expansion, sequential memories, programmable logic devices and programmable logic array

Self-Study Component:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Readings:

- R. Boylestad and L. Nashelsky, Textbook of Electronics Devices & Circuit Theory, PHI Publication.
- R. Gayakwad, Textbook of Operational Amplifiers and Linear Integrated Circuits, PHI Publication.
- A. Mottershed, Textbook of Electronics Devices and Circuits An Introduction, PHI Publication.
- Millman and Halkias, Textbook of Integrated Electronics, Mc Graw Hill.
- Sergio Franko, Textbook of Designing with Operational Amplifiers and Analog Integrated Circuits, Mc Graw Hill.
- R. Coughlin and Driscoll, Textbook of OpAmp & Linear Integrated Circuits, PHI Publications.
- A. Anandkumar, Fundamentals of Digital Circuits, PHI publication
- Malvino, Digital Computer Electronics, TMH publication
- Morris Mano, Computer Logic Design, PHI publication

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering

Semester – III

L	T	P	C
0	0	4	2

Course Code	2EE305
Course Title	Analog and Digital Electronics Laboratory

Course Learning Outcomes (CLO):
At the end of the course, students will be able to-

- compare BJT and FET technology
- suggest and choose application specific integrated circuit
- verify the operations of various analog and digital electronic circuits

A minimum of 20 experiments /simulations based on following topics (but not limited to) will be conducted in this course:

1. BJT operating characteristics
2. FET operating characteristics
3. Conventional amplifier design using single and dual supply
4. Differential amplifier and its characteristics
5. Operation amplifier parameters
6. Linear applications of operational amplifier
7. Non linear applications of operational amplifier
8. Positive feedback applications of operational amplifier
9. Instrumentation amplifiers
10. Function generator and voltage controlled oscillator
11. Low drop out and linear regulators
12. Operational amplifier as error amplifier
13. Characteristics of different Gate ICs
14. Characteristics of different Flipflop ICs
15. Half adder, full adder, BCD adder
16. Half subtractor, full subtractor
17. Multiplerxers-demultiplexers
18. Encoders-decoders
19. Parity bit generators and parity checkers
20. Different Code converters
21. Serial in serial out shift register
22. Serial-in to Parallel-out (SIPO), Parallel-in to Parallel-out (PIPO), Parallel-in to Serial-out

(PISO) shift register, bidirectional shift register

23. Synchronous up-down counters
24. Asynchronous up-down counters

Suggested Readings:

- ✓ R. Boylestad and L. Nashelsky, Textbook of Electronics Devices & Circuit Theory, PHI Publication.
- ✓ R. Gayakwad, Textbook of Operational Amplifiers and Linear Integrated Circuits, PHI Publication.
- ✓ A. Mottershed, Textbook of Electronics Devices and Circuits An Introduction, PHI Publication.
- ✓ Millman and Halkias, Textbook of Integrated Electronics, Mc Graw Hill.
- ✓ Sergio Franko, Textbook of Designing with Operational Amplifiers and Analog Integrated Circuits, Mc Graw Hill.
- ✓ R. Coughlin and Driscoll, Textbook of OpAmp & Linear Integrated Circuits, PHI Publications.
- ✓ A. Anandkumar, Fundamentals of Digital Circuits, PHI publication
- ✓ Malvino, Digital Computer Electronics, TMH publication
- ✓ Morris Mano, Computer Logic Design, PHI publication
- ✓ Tocci, Widmer and Moss, Digital Systems: Principles and Application, Pearson.
- ✓ Various IEEE/IET Papers & Various Product Literature

L = Lecture, T = Tutorial, P = Practical, C = Credit

W.e.f. academic year 2019-20 and onwards

EE301 ANALOG ELECTRONIC CIRCUITS [3 0 2 4]

Course Learning Outcome:

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

1apply the fundamentals of analog electronics circuits and components in various practical applications

2enhance their skills on the facet of Analog Integrated Circuits

3gain hardware skills for implementation of various Analog Circuits

Syllabus:

Transistor Modelling and Small Signal Analysis

Transistor modeling, *r* - parameter model, the hybrid equivalent model, graphical determination of h - parameters, approximate h-parameter model, analysis of CE fixed bias, voltage divider bias configuration, emitter follower configuration.

JFET Biasing and MOSFET

Construction and characteristics of JFET, specification sheet, MOSFET, biasing of JFET, depletion type and enhancement type MOSFETs, FET small signal model, JFET self-bias and voltage divider bias configuration, JFET source follower configuration, application of JFET.

Feedback Amplifier & Oscillator Circuits

Feedback concepts, types of feedback connection, practical feedback circuits, and feedback amplifier - phase and frequency considerations, oscillator operation, phase shift, wien bridge and tuned oscillator circuit, crystal oscillator.

Compound Configuration

Cascade, cascade and darlington connection and its ac and dc analysis.

Differential Amplifier and Introduction to Operational Amplifiers

Basics of differential amplifier, differential amplifier circuit configurations, dc and ac analysis of dual input balanced output differential amplifier, differential amplifier with swamping resistor, constant current bias, current mirror and level translator, equivalent circuit of op – amp, the ideal operational amplifier, concept of open – loop configuration and feedback and virtual short, analysis of simple operational amplifier circuits, frequency response of amplifiers.

Op-amp with Negative Feedback

Concept of negative feedback, voltage series, voltage shunt feedback amplifier & its analysis, differential amplifier with one, two & three op-amp & its analysis, frequency response of op-amp, closed loop frequency response.

Comparators, Converters and Specialized IC Applications

Basic comparator, zero crossing detectors, Schmitt trigger, limitations of op-amp comparator, window detector, voltage to frequency & frequency to voltage converters, 555 based multivibrators, applications of 555, sequential timer circuit, monolithic VCO IC – 566 or its equivalent.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 experiments based on the above syllabus.

References

1. R. Boylestad and L. Nashelsky, Textbook of Electronics Devices & Circuit Theory, PHI Publication.
2. R. Gayakwad , Textbook of Operational Amplifiers and Linear Integrated Circuits, PHI Publication.
3. A. Mottershed, Textbook of Electronics Devices and Circuits An Introduction, PHI Publication.
4. Millman and Halkias, Textbook of Integrated Electronics, Mc Graw Hill.
5. Sergio Franko, Textbook of Designing with Operational Amplifiers and Analog Integrated Circuits, Mc Graw Hill.
6. P. Malvino, Textbook of Electronic Principles, TMH Publishers.
7. R. Coughlin and Driscoll, Textbook of OpAmp & Linear Integrated Circuits, PHI Publications.

Department of Mathematics & Humanities
B.Tech. in Electrical Engineering
Semester-III

L	T	P	C
3	1	0	4

Course Code	**2MA303**
Course Title	**Applied Mathematics for Electrical Engineering**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- comprehend and apply vector calculus and complex analysis in engineering problems
- make use of numerical methods
- apply the concept of Fourier series to solve electrical engineering problems
- use Laplace transformation technique to solve differential equations

Syllabus: **Teaching hours: 45**

Unit 1: Vector differential calculus **05**

Scalar and vector point function, Differentiation of vector field, Gradient of a scalar field and directional derivatives, Divergence and curl of a vector field, Solenoidal, irrotational and conservative fields

Unit 2: Function of complex variables **09**

Limit continuity and Differentiation of a function of complex variables, Cauchy Riemann equations in Cartesian and polar form, Analytic function, Harmonic functions and orthogonal curves, Application of Cauchy Riemann equations in electrostatic problems, integration of function of complex variables, Cauchy's integral theorem, Cauchy's integral formula

Unit 3: Laplace Transforms **10**

Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem, Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transforms in solving ordinary differential equations and electric circuit problems, Laplace transforms of periodic, Unit step and Impulse functions

Unit 4: Fourier Series **08**

Periodic functions, Dirichlet's conditions, Fourier series, Euler's formulae, Fourier expansion of periodic functions with period 2π, Fourier series for discontinues function, Fourier series of even and odd functions, Fourier series of periodic functions with arbitrary periods, half range Fourier series, Harmonic analysis

Unit 5: Numerical Methods **08**

Solution of Transcendental and Algebraic Equations: Newton-Raphson, Bisection, False position, Iteration methods, Convergence of these methods. Solution of System of Linear Equations: Gauss-Seidel and Gauss-Jacobi's methods. Numerical Solutions of Ordinary Differential Equations: Solution of initial value problems: Picard's method, Taylor series method, 4^{th} order Runge – Kutta method

Unit 6: Statistics **05**

Measure of Central Tendency and Dispersion, Correlation and Regression

Tutorial: **Tutorial Hours: 15**

This shall consists of at least 8 tutorials based on the syllabus.

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley.
- Peter V. O'neil, Advanced Engineering Mathematics, Thomson–Books/Cole.
- Dr.B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers.
- S. C. Chapra and R. P. Canale, Numerical Methods for Engineers with Programming and Software Applications, McGraw-Hill Publications.
- M. K. Jain and S. R. K. Iyengar, R. K. Jain-Numerical Methods for Scientific &Engineering Computation, New age International Publication.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

EE303 ELECTRICAL ENGINEERING MATERIALS [2 0 0 2]

Course Learning Outcome:

After successful completion of the course, student will be able to
4improve their understanding about various types of materials
5understand the applications of various electrical materials, their properties and characteristics
6understand the structural behaviour of different electrical materials

Syllabus:

Introduction to Electrical Engineering Materials
Band theory, classification of electrical materials, characteristics of electrical materials.

Conducting Materials
Properties of conducting materials, types of conducting materials- copper, aluminum and silver, material used for special purpose like fuse, filaments, circuit breaker contacts, thermocouples materials, bimetals, soldering materials, materials used for instrumentation system.

Insulating and Dielectric Materials
General property of insulating materials, polarization, dielectric constant, permittivity, surface resistivity and volume resistivity, dielectric strengths, puncture, flashover, types of insulating materials, classification of insulating material according to operating temperature, piezoelectric materials, ceramics: properties and application.

Semiconducting Materials
Introduction to semiconductor physics, properties of semiconductor materials, silicon and germanium, intrinsic and extrinsic semiconductor, doping, hall effect, diffusion drift phenomenon, special semiconductors.

Magnetic Materials
Classification of magnetic material (Diamagnetic ferromagnetic, ferrite, paramagnetic material), soft and hard magnetic material, characteristics of magnetic material, properties of magnetic material (magnetization, permeability, coercivity, retentivity), B-H curve, Hysteresis phenomenon, iron loss, types, methods for reducing iron loss.

Super Conducting Materials
Concepts of super conducting materials, types of super conducting materials, application of super conducting materials in electrical machines, power cables, electromagnets and future prospects.

Special Purpose Materials
Introduction and electrical applications of carbon nanotubes, electrical applications of SiC based devices.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- Ian Jones, Textbook of Material Science for Electrical and Electronic Engineers, Oxford University Press India.
- C. S. Indulkar and S. Thiruvengadam, Textbook of an Introduction to Electrical Engineering Materials, S. Chand Publishing.
- P.L.Kapur, Textbook of Electrical Engineering Materials, Khanna Publishers.
- Dekker Adrianus J., Textbook of Electrical Engineering Materials, Prentice Hall India.
- N. Alagappan and N. Kumar, Textbook of Electrical Engineering Materials, Tata McGraw Hill.
- R. K. Shukla, Textbook of Electrical Engineering Materials, Tata McGraw Hill.

EE304 ELECTRICAL TRANSDUCERS AND MEASUREMENTS [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to
7understand the basic concepts of measurement and measuring systems
8analyze detailed construction and working of various analog and digital instruments
9understand various types of transducers, their working and applications

Syllabus:

Concepts of Measurements & Instrumentation
Introduction to measurement and instrumentation, Methods for absolute measurement, Static and dynamic characteristics of instruments and instrumentation.

Analog Electromechanical Instruments
Classification of analog instruments, Principle of operation, Operating forces, Errors in ammeters and voltmeters, Permanent magnet moving coil, Moving iron, Dynamometer type, Induction type, Electrostatic type instruments, Electrodynamometer type wattmeter, Measurement of active and reactive power, Energy meter for A.C. circuits, Induction type energy meter, Miscellaneous instruments like- Maximum demand indicator, Tri-vector meter, Power factor meter, Frequency meters and Synchroscope.

Measurement of Resistance, Inductance and Capacitance
Measurement of Low, Medium & High resistances, Insulation resistance measurement, A. C. bridges for inductance measurement- Maxwell, Hays, Anderson and Owen bridges, Capacitance measurement – De'sauty and Schering Bridge, Measurement of frequency by Wien's bridge.

Potentiometers and Instrument Transformers
Principle of D. C. potentiometer, direct reading potentiometers, accurate forms of potentiometers, A. C. potentiometer principle, polar and Co - ordinate type A. C. potentiometer, applications of A. C. and D. C. potentiometers, Current and Potential Transformers, Ratio and phase angle errors, Design considerations and testing.

Electronic and Digital Instruments
Introduction, Essentials of an electronic instruments, Advantages of electronic instruments, Types of electronic and digital voltmeters, Transistor voltmeter (TVM), Differential voltmeter, Rectifier type A.C. voltmeter, True r.m.s. reading voltmeter, Vector voltmeter, Electronic multimeter, Advanced electronic energy meter, Electronic and Digital LCR meter, tachometer, Digital storage oscilloscope.

Transducers
Transducers, classification & selection of transducers, Capacitive, inductive and resistive type transducers for linear and angular displacement measurement, Pressure transducer, Flow and level transducer, Force, Torque, Weight strain, Piezo-electric elements, Piezo-electric transducers, Piezo-electric accelerometers, Hall-effect devices, Optical sensors, Ultrasonic transducers.

Thermometry
Resistance temperature detectors, Thermocouples, Thermistors and their circuits, Linear expansion of solid,

liquid and gas for measuring temperature and pressure, Bimetallic strips (thermostat) for temperature measurement.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 laboratory experiments based on the syllabus.

References:

1. A. K. Sawhney, Textbook of a Course in Electrical Measurement and Measuring Instruments, Dhanpat Rai & Sons, New Delhi.
2. E. W. Golding and F. C. Widdis, Textbook of Electrical & Electronic Measurements & Instrumentation, Reem Publications Pvt. Ltd.
3. B. G. Liptak, Textbook of Instrument Engineer's Handbook Vol-2, CRC Press.
4. A. D. Helfrick and W. D. Cooper, Textbook of Modern Electronic Instrumentation and Measurement Techniques.
5. E.O. Doeblin, Textbook of Measurement Systems: Application & Design, McGraw-Hill Professional.
6. D. Patranabis, Textbook of Principles of Industrial Instrumentation, Tata Mcgraw Hill.

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester-III

L	T	P	C
3	1	0	4

Course Code	**2EE303**
Course Title	**Electromagnetic Field Theory**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. apply vector calculus and coordinate system transformation in electromagnetic fields
2. understand and calculate various parameters of electromagnetic fields
3. apply Maxwell's equations to analyse electrical systems

Syllabus **Teaching Hours: 45**

UNIT-1: Vector Calculus **09**

Vector Algebra, Cartesian-cylindrical-spherical coordinate systems, transformation of systems, reorientation, differentiation of vectors, scalar and vector fields, gradient of a scalar function, directional derivative, divergence and curl of vector and their physical meaning, line - surface and volume integrals, Divergence theorem, Stokes's theorem

UNIT-2: Static Electric Field **09**

Coulomb's law, field of n-point charges, fields due to line charge, continuous volume charge and sheet charge, Gauss law and its application, Energy in moving a point charge in electric field, potential gradient, dipoles

UNIT-3: Conductors, Dielectrics and Capacitance **05**

Current density, continuity equation, boundary conditions, capacitance of a two wire line, Poisson's and Laplace's equations and its solution for magnetic and electric fields

UNIT-4: Static Magnetic Fields **07**

Biot-Savart's law, Ampere's law and its applications, scalar and vector magnetic potentials

UNIT-5: Magnetic Forces and Inductance **06**

Force on a moving charge, differential current element, magnetic boundary conditions, changing magnetic fields and inductance

UNIT-6: Maxwell's Equations **03**

Maxwell's equations in point form and integral form, time varying potentials and time harmonic fields

UNIT-7: Applications of Electromagnetic Theory **06**

Finite difference method, finite volume method, Finite element method, Travelling wave

Self-Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial: **Tutorial Hours: 15**

This shall consist of solution of at least 6 tutorials based on the above syllabus.

Suggested Readings:

- William H. Hayt and John A. Buck, Engineering Electromagnetics, TMH Publishing Company Ltd.
- Nathan Ida, Engineering Electromagnetics, Springer (India) Pvt. Ltd., New Delhi.
- John D. Kraus, Electromagnetics, McGraw-Hill Inc., New York.
- Joseph A. Edminister, Theory and Problems of Electromagnetics, McGraw-Hill Inc., New York.
- Mathew N. O. Sadiku, Elements of Electromagnetics, Oxford University Press, New Delhi.
- N. N. Rao, Elements of Engineering Electromagnetics, Pearson Education.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

Institute of Technology
Computer Science and Engineering Department
B. Tech. All Branches
Semester III / IV

SS342 **ICT Tools & Security**

[0 0 2 1]

Course Learning Outcome:

After successful completion of this course, student will be able to

identify various modern ICT based tools and technologies
understand features of the tools which are useful for academic/research/application development
use ICT based tools for programme specific applications
understand the vulnerabilities in the system and protect themselves from the attack

Syllabus:

Appropriate IT security aspect as per latest vulnerabilities and appropriate number of tools are to be identified and studied as per programme specific needs, to be decided by the respective Course Coordinator and to be approved by Dean, FoTE before commencement of the course.

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B. Tech. Semester: III (EE)
Subject: MA304 Mathematics for Electrical Engineers

[4 1 – 5]

Learning Outcome:

- Formulate problems in electrical engineering from real life situations
- Conceptualize the model of electrical problems
- Simplify complex problems and estimate the reasonableness of solutions
- Visualize solutions graphically from inspection of their mathematical descriptions
- Be able to develop mathematical model of physical concepts
- Validate solution to electrical engineering problems.

Syllabus:

Vector differential calculus: Reorinentation(Vector algebra), Differentation of vectors, Scalar and vector point function, Gradient of a scalar field and directional derivatives, Divergence and curl of vector field, Solenoidal, irrotational and conservative fields.

Function of complex variables: Reorinentation, Limit continuity and diffentation of a function of complex variables, Cauchy Riemann equations in cartesian and polar form, Analytic function, Harmonic functions and orthogonal curves, Application of Cauchy Reimann equations in electrostatic problems, integration of function of complex variables, Cauchy's integral theorem, Cauchy's integral formula.

Laplace Transforms :
Motivation, Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem, Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transforms in solving ordinary differential equations, Laplace transforms of periodic, Unit step and Impulse functions.

Fourier Series :
Periodic functions, Dirichlet's conditions, Fourier series, Euler's formulae, Fourier expansion of periodic functions with period 2π, Fourier series of even and odd functions, Fourier series of periodic functions with arbitrary periods, half range Fourier series, Harmonic analysis.

Ordinary Differential Equations : Definition, formation, order and degree, Linear differential equations of higher order with constant coefficients, complimentary function, method of undetermined coefficients, method of variation of parameters, Higher order linear differential equations with variables coefficients (Cauchy's and

Legendre's equation), Simultaneous linear differential equations, Modeling of Electrical circuit.

Partial Differential Equations : Formation of Partial differential equations, Directly integrable equations, Models of Engineering problems leading to first order partial differential equations. Langrange's equation, Method of separation of variable. Applications to Electrical Engineering.

Solution of Transcendental and Algebric Equations :
Newton-Raphson, Bisection, False position, Iteration methods, Convergence of these methods.

Solution of System of Linear Equations :
Gauss-Seidel and Gauss-Jacobi's methods.

Numerical Solutions of Ordinary Differential Equations :
Solution of initial value problems: Picard's method, Taylor series method, 4^{th} order Runge – Kutta method.

Self Study :
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorials :
This shall consist of solution of at least 8 tutorials (TA) based on the above syllabus.

References :

1) Erwin Kreyszig- Advanced Engineering Mathematics (5^{th} Edition) Publishers: John Wiley – 1999.
2) Peter V. O'neil- Advanced Engineering Mathematics (5^{th} Edition) Publisher : Thmoson – Books/Cole, Singapore.
3) Dr.B.S.Grewal- Higher Engineering Mathematics (40^{th} Edition), Khanna Publishers, New Delhi.
4) Dr.K.R.Kachot- Higher Engineering Mathematics Vol. III (2^{nd} Edition), Mahajan Publishing House, Ahmedabad.
5) Dr.B.S.Grewal- Numerical Methods in Engineering and Science with Programs in C and C++ (9^{th} Edition), Khanna Publishers, New Delhi.
6) S. C. Chapra and R. P. Canale, Numerical Methods for Engineers with Programming and Software Applications (6^{th} Edition), McGraw-Hill Publications.
7) M. K. Jain and S. R. K.. Iyengar, R. K. Jain-Numerical Methods for Scientific & Engineering Computation (4^{th} Edition), New age International Publication.

B.Tech. in Electrical Engineering
Semester-III

L	T	P	C
3	1	0	4

Course Code	2EE301
Course Title	Network Analysis and Synthesis

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. understand the basic laws, theorems and the methods of analysing electrical circuits.
2. analyse the properties of coupled circuits and usage of network graph to solve circuits.
3. obtain the transient and steady-state response of electrical circuits.
4. understand two port network and network synthesis.

Syllabus: **Teaching Hours: 45**

Unit-0: Introduction to Course **01**

Need of network analysis and synthesis, Practical relevance, Discussion of course structure, Applications in the field of electrical engineering.

Unit-1: Basic Circuit Fundamentals **06**

Basic definitions, Nature of sources, Kirchhoff's laws, Mesh and Nodal Analysis - Super-mesh and Super-Node Analysis, Source transformation, Duality.

Unit-2: Coupled Circuits **03**

Self and Mutual inductance, Coefficient of coupling, Dot convention, Tuned circuit, Single tuned circuits.

Unit-3: Network Topology **05**

Basic definitions, Formation of incidence, f-tie set and f-cut set matrix, relationship between matrices, Network equilibrium equations.

Unit-4: Network Theorems **06**

Superposition, Thevenin's, Norton's, Maximum power transfer, Tellegen's, Millman's and Reciprocity theorem in DC and AC circuits.

Unit-5: Time Domain Analysis **05**

Initial conditions, Procedure for evaluating initial conditions, Transient analysis of DC & AC circuits.

Unit-6: Frequency Domain Analysis **06**

Laplace transform of standard signals, Shifting theorem, initial and final value theorem, Solution of circuit equations by Laplace transform, Evaluation of circuit response for various signals.

Unit-7: Two Port Networks **04**

Classification of networks, Two port parameters ($Z, Y, ABCD, h$ $Z, Y, ABCD, h$), Condition of Reciprocity and Symmetry, Interrelations between different parameters and Interconnections of various networks.

Unit-8: Network Functions **05**

Calculation of network functions, Poles and Zeros of network functions and their restriction, time domain behaviour from pole - zero plot.

Unit-9: Network Synthesis **04**

Hurwitz Polynomial, Properties of positive real function, necessary and sufficient conditions,

basic synthesis procedure, synthesis of L-C, R-L and R-C driving point functions.

Self-Study Component:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial: **Tutorial Hours: 15**

This shall consist of at least 8 tutorial based on the above syllabus.

Suggested Readings:

1. M E Van Valkenburg, Textbook of Network Analysis, Prentice Hall India.
2. A. Chakrabarti , Circuit Theory- Analysis and Synthesis, Dhanpat Rai & Co.
3. U. A. Patel, Textbook of Network Analysis and Synthesis, Mahajan Publishing House.
4. Akhilesh A. Nimje, Electrical Circuit Analysis and Synthesis, New Age International Publishers
5. William D. Stanley, Textbook of Network Analysis with Applications, Pearson Education (I) Ltd.
6. Franklin F. Kuo, Textbook of Network Analysis and Synthesis, Wiley India.
7. Charles A. Desoer and Ernest S. Kuh, Textbook of Basic Circuit Theory, Tata McGrawhill.
8. Lawrance P. Huelman, Textbook of Basic Circuit Theory, Prentice Hall of India.

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w.e.f. academic year 2019-20 and onwards

NIRMA UNIVERSITY
Institute of Technology
B. Tech - All Branches
Semester III/IV

L	T	P	C
2	0	0	2

Course Code	**2HS341**
Course Title	**Principles of Management**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. interpret the various theories and processes of management
2. relate with different functional areas of management
3. appreciate the role and need of managers in different organisations

Syllabus: Teaching hours:

Unit I **8**

Nature of Management: Concept, Significance, Role & Skills, Levels of Management, Concepts of POSDCORB (Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting). Overview of Decision making. Evolution of Management thoughts, Contribution of F.W Taylor, Henri Fayol and Contingency Approach. Overview of Indian thoughts on Management, Management by Objectives (MBO)

Unit II **4**

Planning: Meaning, Importance, Elements, Process

Unit III **6**

Organizing: Concepts, Structure (Formal & Informal, Line & Staff and Matrix), Meaning, Advantages and Limitations of organizing. Departmentation: Meaning, Basis and Significance, Span of Control: Meaning, Factors affecting span of Control, Centralization vs. Decentralization, Delegation: Authority & Responsibility relationship

Unit IV **6**

Directing, Co-ordination and Controlling: Leading : Concept of leadership, Directing: Meaning and Process, Co-ordination as an Essence of Management, Controlling: Meaning, Process and Technique

Unit V **6**

Functional Management: Introduction to different functional aspects of management- Finance, Operations, Marketing, Human Resource and Strategic Management

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents

Suggested Readings^:

1. Koontz & Weihrich , Essentials of Management; Tata McGraw Hill
2. Tripathy & Reddy , Principles of Management; Tata McGraw Hill
3. Kreitner & Mohapatra, Management ; Biztantra
4. Robbins , Decenzo & Coulter, Fundamentals of Management; Pearson Education
5. Stoner, Freeman & Daniel R Gilbert, Management; Pearson Education
6. Robbins & Coulter, Management; Prentice Hall (India) Pvt. Ltd

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^ this is not an exhaustive list

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester-III

L	T	P	C
2	1	0	3

Course Code	**2EE302**
Course Title	**Signals and Systems**

Course Learning Outcomes (CLO):
At the end of the course, students will be able to-
1. interpret the signals in various forms for analysis
2. analyse various signals in time domain and frequency domain systems
3. obtain Fourier analysis of continuous time and discrete time signals

Syllabus: **Teaching Hours: 30**

Unit-0: Introduction **04**
Types of signals, Basic continuous-time signals, Basic discrete-time signals, Classification of signals and systems, Sampling theorem.

Unit-1: Linear Time-Invariant systems **06**
Response of a continuous-time LTI system, Convolution, Properties of continuous-time LTI systems, Eigen-functions of continuous-time LTI systems, Systems described by differential equations, Response of a discrete-time LTI system and convolution sum, Properties of discrete-time LTI systems, Eigen-functions of discrete-time LTI systems, Systems described by difference equations.

Unit-2: The z-Transform and discrete-time LTI systems **06**
The z-transform, Concept of Region of Convergence, conversion from Laplace to z-transform, z-transforms of some common sequences, Properties of the z-transform, Inverse z-transform, System function of discrete-time LTI System.

Unit-3: Fourier analysis of continuous-time signals Fourier **06**
series representation of periodic signals, Fourier transform, Properties of the continuous-time Fourier transform, Frequency response of continuous-time LTI systems, Introduction to FIR and IIR filters.

Unit-4: Fourier analysis of discrete-time signals **08**
Discrete Fourier series, Fourier transform, properties of the Fourier transform, frequency

response of discrete-time LTI systems, System response to sampled continuous-time sinusoids, discrete Fourier transform, difference between DTFT and DFT, concept and algorithms of FFT

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial: **Tutorial Hours: 15**

This shall consist of at least 08 tutorials based on the above syllabus.

References:

- ✓ Alan V. Oppenheim, Alan S.Willsky, S .Hamid Nawab, Signals and Systems, Pearson Education.
- ✓ Hwei P. Shu, Signals and Systems, Schaum outline, McGraw-Hill Co Ltd.
- ✓ John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Pearson.
- ✓ M. J. Roberts, Signals and Systems: Analysis using Transform method and MATLAB, Tata McGraw-Hill Co Ltd.
- ✓ S. Haykin, Barry Van Veen, Signals and Systems, Wiley India.
- ✓ M. H. Hayes, Digital Signal Processing, Schaum's outline series, Tata McGraw-Hill Co Ltd..
- ✓ Ludeman L. C., Fundamentals of Digital Signal Processing, Wiley India.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

ME321 Thermal and Hydraulics Prime Movers [3 0 0 3]

Course Learning Outcome:

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

- develop an understanding of the fundamental principles of power plant engineering.
- develop an appreciation of role of thermal & hydraulic prime movers in various types of power generating plants.
- understand operation of power plant and works the essential components, their working and construction.

Syllabus:

Properties of Steam: Formation of steam on temperature-enthalpy diagram, types of steam: wet, dry, superheated steam, dryness and wetness fraction, specific enthalpy, specific volume of steam

Steam Boilers: Introduction, classification of various high pressure boilers e.g. Lamont, Velox, Schmidt, Loeffler etc., their characteristics and working principle

Steam Turbines: Classification, compounding, velocity diagrams, work done, diagram and stage efficiency in impulse turbine, impulse reaction turbine, degree of reaction, governing of steam turbines, problems.

Condensers: Introduction, types of condensers, vacuum efficiency, effect of vacuum, effect of air leakage, condenser efficiency, Dalton's law of partial pressure, amount of cooling water, problems

Gas Turbine: Introduction, applications, types of gas turbines, cycles, thermal efficiency, air rate, work ratio, effect of operating variables on thermal efficiency of gas turbine, methods to improve thermal efficiency of gas turbine, gas turbine fuels, starting of plant, comparison with diesel and steam power plants

Hydraulic Turbines: Introduction, Classification of hydraulic turbines, Main components of Pelton wheel, Working, Work done and power produced, Efficiency, Working of Francis turbine, components, Work done & power produced, Efficiency, Working of Propeller & Kaplan Turbine, Main parts & components, Function of components, Work done & power produced by Kaplan Turbine, Efficiency of Kaplan turbine, Governing of Impulse & Reaction Turbine, characteristics curves of impulse & reaction turbine, Draft Tube Theory

Diesel Power Plant: Introduction, diesel engine working principle, diesel fuels, diesel electric plant main components.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Thomas Elliott, Kao, Chen, Robert, Swanekamp –Standard Handbook of Power Plant Engineering, McGraw Hill Publication.
2. P K Nag – Power Plant Engineering, TMH publication
3. Teploenergetika- Thermal Engineering, Springer

Importance of the subject :

After the end of the curriculum of the subject students will able to understand that how power plant works and knows the essential components, their working and construction. The components like steam turbines, Steam Condensers, Gas Turbines, and Hydraulic Turbines which are necessary elements for electrical power production. This will help the society meeting the demands for energy, water and other vital needs.

The objective behind offering this subject is to provide the exposure with a balance of intellectual and practical experiences that enables them to become good technocrats for the meeting the current energy demands of the society. The subject area seeks to focus on technologies for efficient energy conversion and utilization, which aim to meet the urgent challenge of a safe, sustainable energy supply in the face of growing demand of the glob.

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester – IV

L	T	P	C
2	0	2	3

Course Code	**2EE401**
Course Title	**Control Systems Engineering**

Course Learning Outcomes (CLO):
At the end of the course, students will be able to-
1. develop mathematical model of Linear Time Invariant (LTI) System
2. understand behavior of LTI System in time and frequency domain
3. understand design of controller
4. understand state space representation of LTI system and concept of controllability & observability.

Syllabus: **Teaching Hours: 30**

Unit-1: Introduction to control problem **05**
Mathematical model of physical analogous system, Transfer function model of linear time invariant (LTI) system, open loop and closed loop systems, effects of feedback, block diagram reduction technique and introduction to signal flow graphs.

Unit-2: Time response analysis **06**
Standard test signals. Time response of first and second order systems and their design specifications. Concept of stability, Routh and Hurwitz criterion for stability assessment, Root-locus.

Unit-3: Frequency response analysis **06**
Concept of frequency response, frequency domain design specifications, construction of Bode plot and polar plot. Nyquist criterion, Relative stability using Nyquist criterion.

Unit-4: Design of controller **06**
Design of controller using root-locus, design of controller using frequency domain techniques, design of robust control system.

Unit-5: State variable techniques **07**
Concept of state and state variables, state space modelling, solution of state equations, conversion between state space and transfer function model, Concept of controllability and observability, Pole placement by state feedback.

Self-Study Component:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Experiments:
This shall consist of at least 10 experiments / simulations based on the above syllabus.

References:

- Norman S. Nise, Textbook of Control Systems Engineering Vol – I, John-Wiley, New York.
- Nagrath I.J & M. Gopal, Textbook of Control System Engineering, New Age International (I) Ltd.
- M.Gopal, Digital Control and State Variable Methods, TMH Publication, New Delhi.
- Benjamin C. Kuo, Textbook of Automatic Control Systems, Prentice Hall of India, New Delhi.
- K. Ogata, Textbook of Modern Control Systems, K. Ogata, Prentice Hall of India, New Delhi.
- U. A. Patel, Textbook of Control Systems Engineering, Mahajan Publishing House, Ahmedabad.
- R. C. Dorf, Textbook of Modern Control Systems, Pearson Education India Ltd.
- G Franklin, J. D. Powell, Textbook of Feedback Control of Dynamic Systems, Addison Wesley.
- J. C. Doyle, B. A. Francis, Textbook of A. R. Tannenbaum, Feedback Control Theory, Maxwell-McMilan International Edition.
- C. L. Phillips, R. D. Harbour, Textbook of Feedback Control Systems, Prentice Hall

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

EE402 DC MACHINES AND TRANSFORMERS [3 0 2 4]

Course Learning Outcome:

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

- understand construction and operating principle of DC machines and transformers
- acquire knowledge on characteristics of DC machines and transformers for different operating conditions
- test and calculate performance parameters of DC machines and transformers
- select DC machines and transformers for specific application

Syllabus:

Electromechanical Energy Conversion

Principles of energy conversion, singly excited magnetic system, doubly excited magnetic systems.

D. C. Generators

Principle of D.C. generator, construction, types of generators, E.M.F. equation, voltage build up process, critical resistance and critical speed, characteristics of d.c. generators, performance calculations, effect of armature reaction on terminal voltage.

D. C. Motors

Principle of D. C. motor, type of motors, torque equation, characteristics, losses and efficiency, starting of D.C. motors, methods of speed control, armature reaction and commutation, applications.

Single-Phase Transformer

Construction and principle of single phase transformer, operation at no load and on load, vector diagram, equivalent circuit, losses, efficiency and regulation, all – day efficiency, concept of power and distribution transformer, determination of voltage regulation**,** efficiency by direct load test and indirect test methods, parallel operation of single phase transformers, auto-transformer.

Polyphase transformers

Construction and types, different connections and their vector diagrams, parallel operation of two winding transformer, load sharing, Scott connection, tertiary winding, three winding equivalent circuit, voltage regulation, tapping and tap changers, transients in transformer, cooling of transformers.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 10 laboratory experiments based on the syllabus.

References:

1. E. Fitzgerald, Textbook of Electric Machinery, TMH Publications.
2. Nagrath and Kothari, Textbook of Electrical Machines, TMH Publications.
3. P. S. Bhimbra, Textbook of Electrical Machinery, Dhanpatrai Publishers.
4. B. L. Theraja, Textbook of Electrical Technology, Vol. – II, S. Chand & Co.
5. M. G. Say, Textbook of Alternating Current Machines, CBS publishers.

EE403 DIGITAL ELECTRONIC CIRCUITS [3 0 2 4]

Course Learning Outcome:

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

1. acquire knowledge about different families of digital integrated circuits and their characteristics
2. understand programmable logic devices and design circuits based on the logic
3. design, troubleshoot broad range of combinational and sequential circuits

Syllabus:

Number Systems and Codes
Binary, octal, decimal and hexadecimal number systems, their conversion, representation of signed numbers and binary arithmetic in computers, weighted and non-weighted binary codes, grey code, BCD code, alphanumeric codes, error detecting and error correcting codes.

Boolean Algebra and Logic Gates
Introduction, logic operations: AND, OR, NOT, Logic Gate: AND, OR, NOT, NAND, NOR X-OR and X-NOR, Axioms & laws of Boolean algebra De Morgan's theorem, NAND and NOR as universal gates, 7400 series integrated circuits, AOI Gates, introduction to PAL, GAL.

Karnaugh Map and Quine
McClusky Method - Expression of Boolean function to SOP and POS forms, two, three and four variable Karnaugh map, merging & minimization of SOP & POS expressions, don't care combinations, five & six variable Karnaugh map. Quine McClusty method, implementation of Boolean equation using logic gates.

Combinational Circuits
The half and full adder, the half & full subtractor, parallel binary adders, the looks ahead carry adders, subtraction using parallel adders. BCD adders, code converters, parity bit generators/checkers, decoders, display devices, encoders, multiplexers, demultiplexers.

Flip Flops
S-R latch, gated latches, edge triggered S-R flip flop, J-K flip flop, D flip flop, T flip flop. flip flop operating characteristics, master – slave flip flops, application of flip flops.

Shift Registers
Buffer registers, controlled buffer register, 3-state buffer register, data transmission in shift register, serial in - serial out and parallel in - parallel out shift register, bi-directional shift register, application of shift register.

Counters
Asynchronous and synchronous counters and their design, counters ICs.

Logic Families
Digital IC specification terminology, logic families: RTL, DTL, TTL, I^2L, ECL & CMOS, TTL sub families, open collector gates, CMOS sub families, interfacing TTL to CMOS, interfacing ECL to other logics.

Analog to Digital and Digital to Analog Converters
Digital to analog conversion, R-2R ladder type DAC, weighted resistor type DAC, the switched current source type DAC, counter type A/D converter, dual slope type A/D converter, successive approximation type A/D converter.

Memories
Role of memory in computer system, memory types & terminology, ROM organization, types of ROM, semiconductor RAMS, memory extension, sequential memories, programmable logic devices and charge coupled devices.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 experiments based on the above syllabus.

References:

- Morris Mano, Textbook of Digital Logic and Computer Design, Pearson Education.
- Bignell and Donovan, Textbook of Digital Electronics, Delmar (Thomson) Publication.
- A. Anandkumar, Textbook of Fundamentals of Digital Circuits, PHI Publication.
- R.P. Jain, Textbook of Modern Digital Electronics, TMH Publications.

Course Learning Outcome (CLO):

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

- **understand the basic economic theory and economic way of thinking**
- **analyze macro - economic policies**
- **evaluate the economic efficiency in engineering projects**

Syllabus

Module: - 1 MICRO ECONOMICS

1. Basic Economic Concepts: Meaning and understanding of basic economic concepts

2. Demand and Supply: Meaning and Determinants of Demand and Supply, Law of Demand and Supply, Elasticity of Demand and Supply.

3. Production Function: Meaning, production with one variable input, the law of variable proportion, the laws of returns to scale. Economies of Scale

4. Cost Function: Different types of costs, the short run and long run cost functions.

5. Market Structure: Meaning and characteristics of different types of market –

- Perfect Competition
- Monopoly
- Monopolistic Competition and Oligopoly

Module-2 MACRO ECONOMICS

6. Introduction to Macro Economics: Basic Macro Economic Concepts, National Income Accounting, Concepts of National Income and Methods of National Income Computation

7. Inflation: Meaning, types, causes, effect and remedial measures.

8. Money and Banking: Meaning and Functions of money, Money Supply, Commercial Banks and Central Bank-Meaning and Functions

9. Public Finance: Government Expenditure, Receipts, Budget and Deficits.

Self -Study: The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Books:

(1) Micro Economics Robert S Pindyck, Daniel L Rubinfeld, Prem L Mehta - Pearson

(2) Principles of Economics N.Gregory Mankiw, Thomson South Western , Pearson

(3) Modern Economics – H.L.Ahuja – S.Chand & Company

(4) Macro Economics – Rudiger Dornbush, Stanley Fisher, Richard Startz – Tata Mc-Graw-Hill

(5)Principles of Macro Economics, C.Rangarajan and B.H.Dholakia, The McGraw Hill

(6) Economics , Samuelson and Nordhaus, Tata McGraw Hill

(7) Managerial Economics: Principles and Worldwide Applications, Dominick Salvatore, Adapted by Ravikesh Srivastava, Oxford University Press

List of Journals/Periodicals/Magazines/Newpapers: Economist, Indian Economic Review, Asian Economic Review, American Economic Review, Economic and Political Weekly (EPW), Economic Times, Business Standard etc.

Websites Recommended: www.finmin.nic.in www.rbi.org.in www.planningcommission.nic.in etc.

B.Tech. in Electrical Engineering
Semester – IV

L	T	P	C
2	0	2	3

Course Code	2EE402
Course Title	Electrical Measurements and Transducers

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- ✓ understand the concepts of measurement and measurement systems
- ✓ comprehend construction and working of various analog and digital instruments
- ✓ acquire knowledge on working, importance and applications of various transducers
- ✓ appreciate the relevance of data acquisition system and its application in electrical engineering

Syllabus: **Teaching Hours: 30**

Unit-1: Concepts of Measurements and Instrumentation **02**

Introduction to measurement and instrumentation, Static and dynamic characteristics of instruments and instrumentation.

Unit-2: Measurement of Resistance, Inductance and Capacitance **05**

Measurement of low, medium and high resistance, Insulation resistance measurement, Concepts of A. C. bridges for inductance measurement - Maxwell, Hay's, Anderson and Owen bridges; Capacitance measurement – De'Sauty and Schering Bridge, Measurement of frequency by Wien's bridge.

Unit-3: Potentiometers and Instrument Transformers **04**

Principle of D. C. potentiometer, direct reading potentiometers, accurate forms of potentiometers, A. C. potentiometer principle, types and applications of A. C. and D. C. potentiometers, Current and Potential Transformers, Ratio and phase angle errors, Design considerations and testing.

Unit-4: Analog Electromechanical Instruments **04**

Classification of analog instruments, Operating forces, Construction and Principle of Operation of Permanent magnet moving coil, Moving iron, Dynamometer type, Induction type, Electrostatic type instruments, Electrodynamometer type wattmeter, Measurement of active and reactive power, Energy meter for A.C. circuits, Induction type energy meter, Miscellaneous instruments like- Power factor meter, Frequency meters and Synchroscope, Calibration of analog measuring instruments.

Unit-5: Electronic and Digital Instruments **05**

Introduction, Essentials of an electronic instruments, Advantages of electronic instruments, Types of electronic and digital voltmeters, Signal sampling concept in digital instruments, true r.m.s. reading voltmeter, vector voltmeter, electronic multimeter, electronic energy meter, electronic and digital LCR meter, tachometer.

Unit-6: Transducers **04**

Classification and selection criterion for Transducers, Basics of thermometry and thermosensitive sensors, Capacitive, inductive and resistive type transducers for linear and angular displacement measurement, Pressure transducer, Flow and level transducer, Force, Torque, Weight strain, Piezo-electric elements, Piezo-electric transducers, Piezo-electric accelerometers, Hall-effect devices, Optical sensors, Ultrasonic transducers.

Unit-7: Data Acquisition Systems **06**

Basics of ADC and DAC, Digital methods of measurements, Introduction to DAQ systems, PC based measurement techniques, Graphical methods of measurement, Introduction to SCADA.

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Experiments:
This shall consist of at least 10 experiments based on the above syllabus.

Suggested Readings:

- A. K. Sawhney, A course in Electrical Measurement and Measuring Instruments, Dhanpat Rai & Sons, New Delhi.
- E. W. Golding and F. C. Widdis, Electrical & Electronic Measurements & Instrumentation, Reem Publications Pvt. Ltd.
- B. G. Liptak, Instrument Engineer's Handbook Vol-2, CRC Press.
- A. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Pearson / Prentice Hall of India.
- E. O. Doeblin, Measurement systems: Application & Design, McGraw-Hill Professional.
- D. Patranabis, Principles of Industrial Instrumentation, Tata Mcgraw Hill.

L = Lecture, T = Tutorial, P = Practical, C = Credit

W.e.f. academic year 2019-20 and onwards

EE406 ENGINEERING ELECTROMAGNETICS [3 1 0 4]

Course Learning Outcome:

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

1. analyze theoretical and practical meaning of different expressions related to electric and magnetic field
2. apply the concept of electromagnetic field and its significance on working of electric machines and transformers
3. acquire the knowledge of transmission line modelling and effect of various parameters like impedance, admittance etc. on it

Syllabus:

Vector Calculus

Vector Algebra, Cartesian-cylindrical-spherical coordinate systems, transformation of systems, reorientation, differentiation of vectors, scalar and vector fields, gradient of a scalar function, directional derivative, divergence and curl of vector and their physical meaning, line - surface and volume integrals, Green's theorem, Stokes's theorem.

Coulomb's Law

Coulomb's law, field of n-point charges, fields due to line charge, continuous volume charge and sheet charge.

Gauss's Law

Divegence application, Maxwell's first equation, divergence theorem.

Energy and Potential

Energy in moving a point charge in electric field, potential gradient, dipoles.

Conductors, Dielectrics and Capacitance

Current density, continuity equation, boundary conditions, capacitance of a two wire line.

Poisson's and Laplace's Equations

Poisson's and Laplace's equations and its solution for magnetic and electric fields.

Magnetic Fields of Electric Current

Biot-Savart's law, Ampere's law and its applications, Stokes theorem, scalar and vector magnetic potentials.

Magnetic Forces and Inductance

Force on a moving charge, differential current element, magnetic boundary conditions, changing magnetic fields and inductance.

Maxwell's Equations

Maxwell's equations in point form and integral form, time varying potentials and time harmonic fields.

Electromagnetic Wave Propagation

Plane wave in free space – dielectrics - conductors, Poynting vector, reflection and refraction of uniform plane waves.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial Work:
This shall consist of solution of at least 6 tutorials (TA) based on the above syllabus.

References:

1. William H. Hayt and John A. Buck, Textbook of Engineering Electromagnetics, TMH Publishing Company Ltd.
2. Nathan Ida, Textbook of Engineering Electromagnetics, Springer (India) Pvt. Ltd., New Delhi.
3. John D. Kraus, Textbook of Electromagnetics, McGraw-Hill Inc., New York.
4. Joseph A. Edminister, Textbook of Theory and Problems of Electromagnetics, McGraw-Hill Inc., New York.
5. Mathew N. O. Sadiku, Textbook of Elements of Electromagnetics, Oxford University Press, New Delhi.
6. N. N. Rao, Textbook of Elements of Engineering Electromagnetics, Pearson Education.

Syllabus
B. Tech. in Electrical Engineering
Semester IV

EE401 FUNDAMENTALS OF ELECTRICAL POWER SYSTEM [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

1. understand The fundamental concepts of electrical power generation, transmission & distribution
2. understand the economical aspects of power system
3. apply the basic concepts of designing the transmission and distribution system
4. enhancing the ability to identify and solve basic power systems problems

Syllabus:

Generating Stations
Schematic arrangement, choice of site, equipment and efficiency of thermal, hydro, nuclear, gas turbine, combined cycle power plants, comparison.
Employability

Economics of Power Generation
Load curve, load duration curve, maximum demand, connected load, demand factor, diversity factor, depreciation, methods of determining depreciation, tariff, desirable characteristics of tariff, types of tariff.
Employability & Entrepreneur

Power Factor Improvement
Power factor, disadvantages of low power factor, causes of low power factor, power factor improvement equipment, calculations of power factor correction, most economical power factor.
Employability & Entrepreneur

Supply Systems
Comparison of conductor efficiencies for various systems, choice of transmission voltage, economic size of conductor.
Employability

Mechanical Design of Overhead Lines
Different types of towers, sag – tension calculations, sag template, effect of ice covering and wind, overhead line with different levels, methods for measuring and checking the sag during erection, stringing chart.
Employability

Overhead Line Insulators
Types of insulators, materials of insulators, potential distribution over suspension insulator string, string efficiency, methods of improving string efficiency, longer cross arm, grading of insulators, guard ring, failure of insulators, preventive maintenance.
Employability & Skill development

Cables
Construction, classification, insulation resistance, capacitance, dielectric stress, most economical diameter of conductor, grading, methods of laying, causes of failures, calculations of insulation resistance and capacitance, manufacturing processes**.**

Employability & Skill development

Transmission Line Parameters

Transmission line parameters, skin effects and proximity effect, calculation of inductance and capacitance of a single-phase transmission line and three-phase single & double circuit transmission lines, concept of self-geometrical mean distance and mutual geometrical mean distance, transposition, effect of the earth on capacitance of line, stranded and bundled conductors, Ferranti effect.

Employability

Substation

Types of substations, various substation equipment and layout, various bus-bar arrangements, bus-bar design.

Employability & Skill development

Distribution System

Primary and secondary distribution systems, concentrated and uniformly distributed loads on distributors fed at one and both ends, ring distribution, tapered or stepped distributor, voltage drop and power loss calculation.

Employability

Self study:

The self study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self study contents.

References:

- A. Chakrabarti, M. L.Soni, U.S. Bhatnagar & P.V. Gupta, Textbook of Power System Engineering, Dhanpat Rai Publishers.
- S. Ray, Textbook of Electrical Power Systems: Concept, Theory and Practice, PHI Publication.
- J. B. Gupta, Textbook of a Course in Electrical Power, Dhanpat Rai Publishers.
- H. Cotton, Textbook of Transmission & Distribution, CBS Publishers.
- S. L. Uppal, Textbook of Electrical Power, Dhanpat Rai Publishers.
- V. K. Mehta, Textbook of Principles of Power Systems, S. Chand & Co.

EE404 FUNDAMENTALS OF POWER ELECTRONICS [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to
1understand the construction and working of different semiconductor switches and their selection based on the application need
2analyze various triggering circuits used for different semiconductor switches and their comparative study
3acquire knowledge of various power electronic converter for real time application like rectifier, ac voltage controller etc.

Syllabus:

Introduction

Introduction to power electronics, advantages and disadvantages, characteristics, construction and symbol of power diodes, power transistors, SCR, GTO, TRIAC, DIAC, Power MOSFET, IGBT, IGCT, LASCR, Fast recovery diode, Schottkey diode.

Thyristor Rating & protection

Principle and operation of SCR, two transistor analogy, brief idea of construction of SCR, static characteristics of SCR, gate characteristics, methods for turning on and turning off the SCR, protection of SCR, cooling and mounting of SCR, series and parallel operation of SCR, string efficiency and problem associated with series and parallel operation of SCR.

Various Triggering Circuits for Power Devices

R and R – C triggering, DIAC trigger circuits, UJT – based trigger circuits, advanced triggering circuits for thyristor, gate drive circuits for power MOSFET, driver circuits for IGBT.

Thyristor based AC Voltage Controller

Single – phase and three – phase ac voltage controllers, on – off controller, integral cycle controller, principle of operation, analysis with R and R – L loads, cycloconverter.

AC to DC Converters

Uncontrolled rectifier with and without filter, principle of phase controlled converter operation, single – phase full – wave converters, single – phase dual converters, three – phase half bridge converters, three – phase full bridge converters, three – phase dual converters, single – phase semi – converters, three – phase semi – converters.

Multi-pulse Rectifier

Understanding transformer connections for multipulse rectifiers, 12 pulse rectifiers, 18 pulse rectifier.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 experiments based on the above syllabus.

References:

1. M. H. Rashid, Textbook of Power Electronics Circuits Devices & Application, Pearson Education.
2. M. S. Jamil Asghar, Textbook of Power Electronics, Prentice Hall of India.
3. Ned Mohan, Textbook of Power Electronics, Wiley.
4. P. C. Sen, Textbook of Power Electronics, Tata McGraw Hill.

B.Tech. in Electrical Engineering

Semester – IV

L	T	P	C
3	1	0	4

Course Code	**2EE403**
Course Title	**Fundamentals of Power System**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- **understand the conventional and renewable energy sources of power generation, with associated issues and challenges**
- **apply the basic concepts of designing the transmission and distribution system**
- **know the technical specifications to be met by the utility and the consumer to ensure secure and economic functioning of the grid**

Syllabus:	**Teaching Hours: 45**
Unit-1: Prime Movers	**06**
Properties of steam, high pressure steam boilers, classification and operation of steam turbines and hydraulic turbines ***Employability***	
Unit-2: Generating Stations and basics of Power Generation	**06**
Single line diagram of power system, Structures of power system: bulk power grids and micro-grids, schematic diagram, choice of site, equipment and efficiency for thermal power plant, hydro power plant, nuclear power plant, gas turbine power plant, combined cycle power plants, load curves ***Employability***	
Unit-3: Renewable Energy Resources	**06**
Distributed and bulk power generation through renewable energy, Solar and wind electrical power systems, issues and concerns of large percentage of renewable penetration in grid and possible solutions ***Employability & Entrepreneur***	
Unit-4: Electrical and Mechanical Design of Overhead Transmission Line	**08**
Transmission line parameters, calculation of inductance and capacitance, transmission tower and its components, sag – tension calculations, string efficiency and its improvement, most economical diameter of conductor, concepts of corona ***Employability***	
Unit-5: Performance of Transmission Lines	**08**
Classification and performance of short lines, medium and long transmission lines, generalized constants, Ferranti effect, power circle diagram ***Employability***	

Unit-6: Distribution System	**08**
Sub-stations types and equipment, layouts and bus-bar configuration, supply system, various configurations of distribution system, earthing, underground cables ***Employability & Skill development***	
Unit-7: Electricity Regulations	**03**
Scenario of Indian power sector, introduction to Electricity Act 2003 and Indian Electricity Grid Code (IEGC), Energy Conservation Act, tariff, power factor improvement ***Employability & Entrepreneur***	

Self-Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial: **Tutorial Hours: 15**

Tutorial work will be based on above syllabus with minimum 08 tutorials to be incorporated.

Suggested Readings:

1. D.P. Kothari and I. J. Nagrath, Modern Power System analysis, McGraw Hill.
2. A. Chakrabarti, M. L. Soni, U.S. Bhatnagar and P.V. Gupta, Power System Engineering, Dhanpat Rai Publishers.
3. S. Sivanagaraju and S. Satyanarayana, Electric Power Transmission and Distribution, Pearson Education.
4. P. K. Nag, Power Plant Engineering, McGraw Hill Education (India) Private Limited.
5. D. P. Kothari, K. C. Singal and Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, PHI Learning Private Limited.
6. J. B. Gupta, A Course in Electrical Power, Dhanpat Rai Publishers.
7. H. Cotton, Transmission & Distribution, CBS Publishers.
8. Indian Electricity Grid Code, Ministry of Power, Government of India.
9. The Electricity Act, 2003, Central Electricity Regulatory Commission.
10. The Energy Conservation Act, 2001, Ministry of Power, Government of India.

B.Tech. in Electrical Engineering
Semester – IV

L	T	P	C
3	0	0	3

Course Code	**2EE405**
Course Title	**Power Electronic Converters and Applications**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- analyze operation of devices and choose the same suitable for an application
- evaluate various performance parameters of converters
- implement and analyze different control techniques for power electronic converters
- choose and apply converter topology suitable for an application

Syllabus: **Teaching Hours: 45**

Unit-0: Introduction to Course **01**

Overview of power electronic converters and their application

Unit-1: Power Semiconductor Devices **08**

Construction, characteristics and ratings of MOSFET, Insulated Gate Bipolar transistors (IGBTs), SCR, TRIACs, Light Activated SCRs (LASCRs), Unijunction transistor (UJT), Gate turn-off Thyristors (GTOs), Integrated Gate-Commutated Thyristors (IGCTs), MOS-controlled thyristor (MCT), Silicon carbide (SIC), Gallium nitride devices, Power Integrated circuits (PICs), Intelligent Modules

Unit-2: AC to DC Converters **07**

Single Phase Half Wave and full wave Controlled Rectifiers with R, RL and RLE loads, Three Phase Half Wave and Full Wave Controlled Rectifier with R, RL, RLE loads, Dual Converter with circulating and non-circulating current mode, Effect of source inductance in controlled rectifiers, Introduction to PWM rectifiers

Unit-3: Non Isolated and Isolated DC-DC Converters **06**

Importance & Requirement of DC Power Supply, Non-Isolated DC-DC Converters: Buck, Boost, Buck-Boost, Cuk, SEPIC and Zeta converters, Requirement and Importance of Isolation in Power Electronics Circuits – Advantages, Flyback – Forward – Push Pull, Half bridge, Full bridge converters

Unit-4: DC-AC Converter **07**

Basic concept of inverters, three phase inverters (120° and 180° mode), Multilevel inverters- Diode Clamped, Flying Capacitor & Cascaded H-Bridge, Different types of PWM strategies-Multi carrier PWM, Single & Multiple PWM – Sine Triangle PWM (Bipolar & Unipolar), SVPWM

Unit-5: AC-AC Converters **05**

Principle of Phase Control – Single Phase AC Voltage Controllers with R and RL loads, Three Phase AC Voltage Controllers with R and RL loads, Principle of On-Off (ICC) Control. Basic principle of operation-Single phase to single phase, Three phase to single phase Cycloconverter. Three phase to three phase cycloconverter

Unit-6: Electric Drives **03**

Semi-converter and Fully Controlled converter based dc motor drives, chopper control based dc motor drives, Solar and battery powered drives

Unit-7: Power Electronic control for Utility Systems **05**

High voltage DC Transmission, Power electronic transformer, Static excitation systems, Static VAR compensators, Static circuit breakers, Renewable energy based systems – solar & wind, Power

Quality improvement devices – active power filter & active front end converter

Unit-8: E-mobility **03**

Power Electronic converters & their control for Electric vehicles, Control of electric motors for traction

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, Pearson Education, New Delhi
2. Ned Mohan, Tore M. Undeland and William P. Robbins, Power Electronics: Converters, Applications and Design, John Wiley & Sons, Inc., New York
3. L Umanand, Power Electronics, Essentials & Applications, Wiley India
4. M. S. Jamil Asghar, Power Electronics, Prentice-Hall of India Pvt. Ltd., New Delhi
5. M. D. Singh and K. B. Khanchandani, Power Electronics, Tata McGraw-Hill Publishing Company Ltd., New Delhi
6. G. K. Dubey, S. R. Doradla, A. Joshi, R. M. K. Sinha, Thyristorized Power Controllers, New Age International, Delhi
7. B. Jayant Baliga, Power Semiconductor Devices, Thompson Course Technology, Singapore.
8. P. S. Bhimbra, Power Electronics, Khanna Publishers, New Delhi
9. C. W. Lander, Power Electronics, McGraw-Hill, UK
10. P. C. Sen, Modern Power Electronics, S. Chand, New Delhi
11. Mukund R. Patel, Wind and Solar Power Systems, CRC Press, Florida
12. Chetan Singh Solanki, Solar Photovoltaics: Fundamentals, Technologies and Applications, Prentice Hall, New Delhi
13. Joseph Vithayathil, Power Electronics, Principles and Applications, Indian Edition, McGraw- Hill
14. Research Papers on IEEE/IET/Science Direct etc.
15. Product Literatures

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering

Semester – IV

L	T	P	C
0	0	4	2

Course Code	**2EE406**
Course Title	**Power Electronics Laboratory**

Course Learning Outcomes (CLO):
At the end of the course, students will be able to-
1. illustrate the characteristics and operation of various switching devices
2. suggest triggering methods for various converters
3. analyze and implement converter circuits by using suitable power semiconductor devices
4. evaluate various performance parameters of converters
5. apply suitable speed control method to various power electronic converter controlled dc motors

A minimum of 20 experiments / simulations based on following topics (but not limited to) will be conducted in this course:

- SCR characteristics and triggering circuits
- Single-phase and three-phase half-controlled as well as fully-controlled bridge rectifiers with R, R-L and R-L-E loads
- Dual-converter with and without circulating currents
- Working of TRIAC and its triggering circuits
- Characteristics and triggering of MOSFET and IGBT
- Applications of pulse transformer and optocouplers for isolation purposes
- Operation of multi-pulse converters and its importance in power quality improvement
- Working of ac to ac converters (ac voltage controllers and cycloconverters) with R and R-L loads
- Operation of dc to dc converters (choppers)
- Design and testing of buck, boost, buck-boost, push-pull, full-bridge converters
- Working of single-phase and three-phase inverters
- Operation of Uninterrupted Power Supply (UPS)
- Concept of power factor correction devices
- Speed control and braking of dc electric motors
- Functioning of switched mode power supplies

- Generation of dead-band for inverter leg

- Different PWM schemes and their closed-loop control
- PWM rectifiers
- Solar and battery powered drives
- Power electronic transformer.

Suggested Readings:

1. Muhammd H. Rashid: Power Electronics: Circuits, Devices and Applications, 3rd Edition, Pearson Education, New Delhi, 2004.
2. Ned Mohan, Tore M. Undeland and William P. Robbins: Power Electronics: Converters, Applications and Design, John Wiley & Sons, Inc., New York, 2003.
3. L Umanand: Power Electronics, Essentials & Applications, Wiley India, 2011.
4. M. S. Jamil Asghar: Power Electronics, Prentice-Hall of India Pvt. Ltd., New Delhi, 2005.
5. M. D. Singh and K. B. Khanchandani: Power Electronics, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2001.
6. G. K. Dubey, S. R. Doradla, A. Joshi, R. M. K. Sinha: Thyristorized Power Controllers, New Age International, Delhi 1986.
7. B. Jayant Baliga: Power Semiconductor Devices, Thompson Course Technology, Singapore, 2004.
8. P. S. Bhimbra: Power Electronics, Khanna Publishers, New Delhi, 2001.
9. C. W. Lander: Power Electronics, McGraw-Hill, UK, 1981.
10. P. C. Sen: Modern Power Electronics, S. Chand, New Delhi, 2005.
11. Mukund R. Patel: Wind and Solar Power Systems, CRC Press, Florida, 2000
12. Chetan Singh Solanki: Solar Photovoltaics: Fundamentals, Technologies and Applications, Prentice Hall, New Delhi, 2009
13. Joseph Vithayathil: Power Electronics, Principles and Applications, Indian Edition, McGraw- Hill, 5th Edition, 2013.
14. Various IEEE/IET Papers & Various Product Literature

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

NIRMA UNIVERSITY
Institute of Technology
B. Tech. - All Branches Semester III/IV

L	T	P	C
2	0	0	2

Course Code	**2HS342**
Course Title	**Principles of Economics**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- interpret the various basic economic principles
- relate the economic fundamentals with engineering practices
- infer the macro-economic aspects of engineering projects

Syllabus: Teaching hours:

Unit I **3**

Basic Economic Concepts: Needs, wants, means/resources – marginal principle and economic efficiency, trade - off, opportunity cost, rationality, externalities, differences between micro economics and macro economics

Unit II **3**

Demand and Supply: Meaning and determinants of demand and supply, law of demand and law of supply equilibrium between demand and supply.. The concept of elasticity – meaning and types

Unit III **3**

Production, Cost and Revenue: Production function, law of variable proportion and laws of returns to scale, different types of costs – variable cost, fixed cost, total cost, average cost, average fixed cost, average variable cost and marginal cost, Total revenue, average revenue and marginal revenue, profit function

Unit IV **6**

Market Structures & Pricing: Concept of market and equilibrium- characteristics of perfect competition, monopoly, monopolistic competition and oligopoly–price determinations

Unit V **7**

Macro-Economic Environment: Basic macro- economic concepts –aggregate demand aggregate supply, money, income employment consumption savings and investment. National Income Accounting-concepts and methods of national income – recent changes in the methodology of national income accounting

Unit VI **Banking:** Meaning and functions of commercial banks and central bank	**3**
Unit VII **Inflation:** Meaning, and types of inflation, Causes and effect of inflation on different **s**ectors of the economy	**2**
Unit VIII **International Trade:** Meaning and significance of International Trade, Cases for and against globalization. World Trade Organization (WTO) – functions and recent deliberations in World Trade Organization (WTO)	**3**

Self -Study:

The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings^:

1. Mankiw, N. G. Principles of Economics. Mason. Mason,USA: South-Western Cengage Learning.
2. Samuelson P. A. & Nordhaus, W.D. Economics. India: Tata McGraw Hill Education.
3. Pindyck, R.S., Rubinfeld, D. L. & Mehta, P. L. Micro Economics. New Delhi, India: Pearson.
4. Ahuja H.L. Modern Economics. New Delhi,India: S. Chand & Company Ltd.
5. Dornbusch, R., Fisher, S, & Startz, R. Macro Economics. India: Tata McGraw Hill Education.
6. Gupta, G. S. Macro Economics Theory and Applications. India:Tata McGraw Hill.

L =Lecture, T =Tutorial, P= Practical, C=Credit

^ this is not an exhaustive list

EE407 **SEMINAR** **[0 0 1 1]**

Course Learning Outcome:

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

- develop communication skill, appreciate ideas and thoughts
- enhance subject related knowledge by discussing various topics.

A student is required to select a topic relevant to the subjects/interest during course of the study. He/She will prepare seminar report & will present his/her work before the examiners / faculty coordinator.

NIRMA UNIVERSITY
Institute of Technology
B. Tech. in Electrical Engineering
Semester – IV

L	T	P	C
3	0	2	4

Course Code	**2EE404**
Course Title	**Transformers and DC Machines**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- understand the construction and operating principle of transformers and DC machines.
- acquire knowledge on performance indices of transformers and DC machines.
- select transformers and DC machines for specific application based on characteristics.
- understand the use of Permanent Magnet materials in DC machines.

Syllabus: **Teaching Hours: 45**

Unit-0: Electromechanical Energy Conversion **02**
Principles of energy conversion, singly excited magnetic system, doubly excited magnetic system

UNIT-1: Single-Phase Transformers **12**
Construction and principle of single phase transformer, operation at no load and on load, inrush current, harmonics in transformer, phasor diagram, equivalent circuit, losses, efficiency and regulation, all – day efficiency, concept of power and distribution transformer, determination of voltage regulation, parallel operation of single phase transformers, auto-transformer, efficiency by direct load test and indirect test methods

Unit-2: Polyphase Transformers **13**
Construction and transformer types, different types of connections and their phasor diagrams, selection of the transformer connections for power system applications, parallel operation of two winding transformer, load sharing, Scott connection, tertiary winding, types of windings, short circuit forces on transformers, cooling of transformers, accessories and protection of transformers, various tests on transformers

Unit-3: DC Machines **08**
Construction and operating principle of D.C. machines, emf equation, types, concept of back emf, motor torque equation, characteristics, power flow diagram, speed control, commutation, Concept of DC generators

Unit-4: Permanent Magnet materials and PMDC Motors **10**
Types of magnetic and permanent magnet materials, B-H loop and demagnetization

characteristics, temperature dependence and effects, mechanical properties, construction and working of PMDC motors, characteristics and applications of PMDC machines

Self-Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 10 laboratory experiments / simulations based on the syllabus.

Suggested Readings:

1. E. Fitzgerald, Electric Machinery, TMH Publications.
2. M. G. Say, Alternating Current Machines, CBS publishers.
3. Nagrath and Kothari, Electrical Machines, TMH Publications.
4. P. S. Bhimbra, Electrical Machinery, Dhanpatrai Publishers.
5. Venkatratnam K., Special Electric Machines, CRC Press.
6. Janardanan E. G, Special Electrical Machines, Prentice Hall India Learning Pvt. Ltd.
7. Miller T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Clarendon Press.
8. Hanselman D., Brushless Permanent-magnet Motor Design, McGraw Hill.
9. B. L. Theraja, Electrical Technology, Vol. – II, S. Chand & Co.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards

Nirma University
Institute of Technology
Electrical Engineering Programme
B. Tech. in Electrical Engineering
Semester V

EE501 Analysis of Electrical Power System [3 1 0 4]

Course Learning Outcome:
After successful completion of the course, student will be able to

1. evaluate the performance parameters of transmission lines
2. understand and analyze the effects of various faults in the power system
3. select appropriate type of grounding system and reactive power compensation techniques

Syllabus:

Performance of Transmission lines: Classification of transmission lines, Performance of short, medium and long transmission lines, Generalized constants for transmission line, Use of bundled conductors and selection aspects of conductors. **Employability & Skill development**

Representation of Power System Components: One line diagram, Impedance/ reactance diagram, Per unit system representation. **Employability**

Power Circle Diagram: Receiving and sending end power circle diagrams, Universal power circle diagram. **Employability**

Symmetrical Fault Analysis: Formation of Z bus matrix, Transient on a transmission line, Short circuit of an unloaded and loaded synchronous machine, Reactances of a synchronous machine, Short circuit current computations, Current limiting reactors, Algorithm for short circuit studies. **Employability**

Symmetrical Components: Symmetrical transformation, Phase shift in star-delta transformers, Sequence impedances of power system components, Sequence networks of power system. **Employability**

Unsymmetrical Fault Analysis: Symmetrical component analysis of unsymmetrical faults. **Employability**

Corona: Introduction, Phenomenon of corona formation, Calculation of potential gradient, Critical voltages, Corona loss formula, Factors affecting corona loss, Methods of reducing corona loss, Radio interference. **Employability**

Earthing: Introduction, Isolated neutral, Earthed neutral systems, Solid, resistance, Reactance, Arc suppression coil, Voltage transformer earthing and earthing transformer, Equipment earthing - plate earthing, pipe earthing, Substation earthing. **Employability & Skill development**

Reactive power and voltage control: Production and absorption of reactive power, Voltage control methods, Static VAR systems. **Employability**

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 08 tutorials to be incorporated.

References:

1. D.P. Kothari and I.J. Nagrath, Modern Power System Analysis, McGraw Hill
2. S. S. Vadhera - Power System Stability and Control, Dhanpat Rai
3. John J Grainger, William D Stevenson Jr., Power System Analysis, McGraw Hill.
4. C. .L. Wadhwa, Electrical Power Systems, New Age International (P) Ltd.
5. A. Chakrabarti, M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A Textbook on Power System Engineering, Dhanpat Rai & Co.

EE503 High Voltage Engineering [3 0 2 4]

Course Learning Outcome:

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

1plot electric field profile for simple configurations

2select the appropriate insulation (material, thickness, gap distance) for basic applications

3understand high voltage test setup for devices

4analyze the tests results and predict the imminent equipment failure

Syllabus:

Electrostatic fields and field stress control: Electrical field distribution and breakdown strength of insulating materials, Uniform and non-uniform field electrode arrangements, Field distortion & stress control.

Electrical breakdown in gases: Classical gas laws, Townsend first and second ionization coefficient, Transition from non-self-sustained discharges to breakdown, Townsend mechanism, Equation for current growth, The Streamer or 'Kanal' mechanism of spark, The sparking voltage – Paschen's law, Cathode processes - related to vacuum, Breakdown in vacuum, the breakdown field strength (E_b), Breakdown in non-uniform fields, Breakdown under impulse voltages, Experimental studies of time lags.

Breakdown in solid and liquid dielectrics: Breakdown in solids - intrinsic breakdown, Electromechanical breakdown, Thermal breakdown, Edge and erosion breakdown – treeing & tracking, Composite dielectric breakdown, Breakdown in liquids - electronic breakdown, Suspended solid particle mechanism, Bubble and cavity breakdown, Models of dielectric breakdown, Various breakdown theories, Transformer oil purification.

Generation of high voltages and current: Direct voltages, voltage doubler circuits, Cockcroft Walton circuit, Electrostatic generators, Alternating voltages, Cascade transformers, Series resonant circuits, Tesla coils, Impulse voltages - impulse voltage generator circuits, Operation and design, Control systems, Impulse current generation - circuits, Operation and design.

Measurement of high voltages and current: Peak voltage measurements by spark gaps - sphere gaps, Uniform field gaps, Rod gaps, Electrostatic voltmeters, Ammeter in series with high ohmic resistors and high ohmic resistor voltage dividers, Generating voltmeters, The Chubb–Fortescue method, High voltage capacitors for measuring circuits, Voltage dividing systems and impulse voltage measurements, Effect of lead, Impulse current measurement, Rogowski coil.

Non-destructive insulation test techniques: Dynamic properties of dielectrics, Modelling of dielectric properties, DC resistivity measurement, Complex permittivity, Dielectric loss (tan delta) and capacitance measurements, RIV measurement, SFRA technique - concept, Procedure, Inference, Partial Discharge (PD) concept, Apparent charge, Measurement circuits, Concept of Dissolved Gas Analysis (DGA) – key gas method, Duval's triangle.

Over voltages, testing procedures and insulation coordination: The lightning mechanism, simulated lightning and switching surges for testing, Basic concept and limited derivations related to travelling waves, Use of Bewley's lattice diagram for simple cases, Laboratory high-voltage testing procedures, Insulation coordination, correlation between insulation and protection levels (BIL / SIL), Lightning protection methods.

Testing of external insulation: Operation in a contaminated environment, Flashover mechanism of polluted insulators under AC and DC., Procedure for clean fog testing, Use of ceramic and non-ceramic insulators, Introduction to bushings, Brief discussion on bushing testing.

Self study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:
1.Kuffel, Zaengl and Kuffel, High Voltage Engineering Fundamentals, Newnes Publications.

2.Wadhwa C L, High Voltage Engineering, New Age Publications.

3.Naidu M S and Kamraju V, High Voltage Engineering, Tata McGraw Hill Publications.

4.Alston L L, High Voltage Technology, Oxford University Press.

5.Abdul Salem M A, Anis H, et al., High Voltage Engineering - Theory and Practice, Marcel Dekker.

6.Begamudre R D, High Voltage Engineering Problems and Solutions, New Age International Publishers.

Nirma University
Institute of Technology
Mathematics & Humanities Department
SS562, Law for Engineers

[2 - - 2]

Course Learning Outcome

By the end of the course, students will be able to

- Understand the Indian Legal System and Basics of different laws.
- Understand, explore, and acquire practical insight of legal system and its application in engineering profession.

Syllabus

Unit I
Introduction to Indian Legal System: Constitution of India, Sources of Law and Judicial system

Unit II
1.Contracts and its Elements: Employment contracts, Contract Interpretation, Service Contract, Contract of Indemnity, Law of Agency
2.Employment agreement

UNIT 3
1Legal Documentation: Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and sub-contracting

UNIT 4
1.Intellectual Property Rights (IPR): Overview
2.Trademarks, Copy Rights, Patents with special emphasis in Biotechnology Inventions, software, circuits and design
3. Protection in Foreign Countries

UNIT 5
1. Cyber Laws, E-Commerce and E-Governance

UNIT 6 Introduction to Labour Laws
1. Labour Laws: Provident Fund, ESIC, Gratuity, Bonus, Perquisites, Contract labour
2. Health, Safety and welfare of construction workers.

UNIT 7
Taxation: Income Tax, Service Tax, VAT, Excise Duty

UNIT 8
Alternate Dispute Resolution (ADR) in Domestic and International dealings

UNIT 9
Introduction to Criminal Law
RTI Act

References

1. Karnika Seth, Computer Internet and New Technology Laws, Lexisnexis, First Edition 2013.
2. Prafulla C Pant, The Arbitration And Conciliation Act, 1996, Butterworths India, New Delhi.
3. Joseph Minattur, Indian Legal System, Indian Law Institute, New Delhi.
4. J. Beatson, Anson's Law Of Contract, Oxford University Press.
5. V. S. Datey , Indirect Taxes: Law And Practice, Taxmann Publications (P) Ltd, Latest Edition
6. Dr. Vinod K. Singhania And Dr. Monica Singhania , Student's Guide To Income Tax, Taxmann Publications (P) Ltd, Latest Edition.
7. S.C. Srivastava, Industrial Relations And Labour Laws, Vikas Publishing House Pvt. Ltd.

EE506 Microprocessor and Microcontroller [3 0 2 4]

Course Learning Outcome:

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

1 understand the fundamentals and generalized architecture of microprocessor and microcontroller

2 develop algorithm/program of the microprocessor and microcontroller for a particular task

3 interface microcontrollers with external peripherals

Syllabus:

Introduction to Microprocessor and its architecture: Evolution of microprocessors and microcontrollers, Block diagram of microcomputer and its organization, Concept of system bus, 8085 Microprocessor architecture and organization, Pin diagram and function of each pin.

Programming of 8085 in assembly: 8085 programming model, Instruction classification and format, Concept of assembly language programming, Addressing modes, Data transfer instructions, Arithmetic instructions, Logical group of instructions, Branching instructions, Special instructions and their applications, Timing diagrams, Push-Pop and stack operations, Use of subroutines in program, Monitor subroutines, Time delay calculations and its applications, Code conversion.

Microcontroller architecture: Introduction, 8051 Microcontroller internal architecture, I/O pins, Ports, Counters, Timers, Interrupts, Serial data input/output, Special Function Registers, Internal memory organization.

Programming of 8051 in assembly and C: Addressing modes, Data transfer instructions, Arithmetic instructions, Logical group of instructions, Branching instructions, Assembly language programming, Timing diagrams, Data types and time delay in 8051 C, I/O programming, Serial port programming, Timer programming, Interrupts programming.

Applications of 8051: ADC, DAC, Sensor interfacing, Microprocessor based relay applications, LCD interfacing, Keyboard interfacing, DC Motor interfacing, 8051 interfacing to external memory, Embedded C programming for different applications.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. K.J.Ayala, The 8051 Microcontroller Architecture, Programming and Applications, Penram International Publications.
2. Mazidi and Mazidi, 8051 Microcontroller and Embedded system, Pearson Publications.
3. R.S.Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram International Publications.
4. B.Ram, Fundamentals of Microprocessors and Microcontrollers, Dhanpat Rai Publishing Co.
5. R.S.Kaler, A Textbook of Microprocessors and Microcontrollers, I.K.International Publishing house.

EE507 Mini Project-I [0 0 2 1]

Course Learning Outcome:

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

1. practice acquired knowledge within the chosen area of technology for project development
2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:
product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

EE504 Power Electronic Converters [3 0 2 4]

Course Learning Outcome:

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

4 suggest converter topology based on application

5 analyze and implement various control techniques for power electronic converters

6 evaluate various performance parameters of converters

Syllabus:

Choppers: Principle of step-down, Step-up and up-down choppers under various loading conditions, Analysis and design of chopper circuits.

Power Supplies: Linear power supply, Switched mode power supply, Various isolated and non-isolated converter topologies, Uninterruptable power supply, Introduction to resonant converters, PWM converters.

Inverters and PWM Techniques: Single-phase and three-phase voltage source inverter, Current source inverter, Performance parameters of inverter, Square wave and quasi square wave operation, 120° and 180° mode of operation, Various PWM techniques and their comparative study.

Matrix Converters: Introduction, Overview of different topologies and control schemes of matrix converters, Applications of matrix converters.

Applications of Converters: Standalone solar inverter, Inverter for wind applications, Vehicle applications, Inverter for induction heating.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. M. H. Rashid, Power Electronics Circuits Devices & Application, Pearson Education.
2. M. S. Jamil Asghar, Power Electronics, Prentice Hall of India, New Delhi.
3. Ned Mohan, Power Electronics, Wiley.
4. L. Umanand, Power Electronics Essential & Applications, Wiley India Pvt. Ltd.
5. P. C. Sen, Power Electronics, Tata McGraw Hill.
6. Bin Wu, High Power Converters and AC Drives, Wiley - IEEE Press.

EE502 Rotating AC Machines [3 0 2 4]

Course Learning Outcome:
After successful completion of the course, student will be able to

1. understand construction and operating principle of induction motor and synchronous machine
2. acquire knowledge on characteristics of induction motor and synchronous machine for different operating conditions
3. test and calculate performance parameters of induction motor and synchronous machine
4. analyze and select machine for specific application

Syllabus:

Polyphase Induction Motors: Rotating magnetic field, Motor construction, Motor specifications, Types of motors, Principle of operation, Basic equations, Vector diagram, Equivalent circuit, Torque and power equations Torque/slip characteristics, Performance calculations, Circle diagram, High torque motors, Manual and Automatic starting methods, Speed control – conventional and v/f control, crawling and cogging, Unbalanced operation of 3-phase induction motors, Applications, Motor enclosures

Single-phase Induction Motor: Types, Double field revolving theory, Equivalent circuit, Determination of motor parameters, Methods of starting, Applications.

Alternator: Principle of operation, Constructional features and types, emf equation, Distributed ac windings, Distribution and coil span factors, Effect of harmonics on emf and its elimination, Armature reaction in cylindrical and salient pole machines, Two reaction theory, Equivalent circuit of cylindrical and salient pole machines, Voltage equation, Output equations, Vector diagrams, Voltage regulation by synchronous impedance, MMF and Zero Power Factor (ZPF) method, Transient and sub-transient reactance, Short circuit ratio (SCR), Concept of reactive power control through excitation system, Condition for maximum power, Synchronizing power and torque, Synchronizing conditions and methods, Operational aspects of alternators on infinite bus

Synchronous Motor: Principle of reversibility, Voltage equation, Phasor diagram, Torque and power equations, Steady state operating characteristic, 'V' and inverted 'V' curves and 'O' curves, Circle diagram, Starting, hunting, damper windings and its effect, Synchronous condenser, Construction and Working principle of auto synchronous motor

Basic AC Commutator Motors: 1-phase ac commutator motors, 1-phase ac series motor, Universal and Repulsion motors

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. M. G. Say, Performance and Design of Alternating Current Machines, CBS Publishers.
2. I.J.Nagrath and D. P. Kothari, Electrical Machines, Tata McGraw-Hill.
3. P. S. Bhimbra, Electrical Machinery, Khanna Publishers.
4. B. L.Theraja, Electrical Technology, Vol. – II, S. Chand & Co.
5. E. Fitzgerald, Electric Machinery, Tata McGraw-Hill.

EE505 Utilization of Electrical Power [2 0 0 2]

Course Learning Outcome:

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

- apply different techniques to use electrical energy to obtain heating, welding, illumination and electrolysis process
- design illumination scheme to obtain required lux level at given location
- analyze for electrical energy consumption in existing building and estimate for energy efficient design

Syllabus:

Electric Heating: Types of electric furnaces: resistance, arc, Induction, Dielectric and microwave - concept and operation of each type, Temperature control of furnaces.

Electric Welding: Types of welding: Arc and resistance, Electric supply for arc welding, Concept and operation of each type, Choice of welding time, Welding techniques.

Electrolytic Process: Basic principle of electro deposition, Application of electrolysis, Electric supply for electrolytic process.

Electric Installation & Illumination: Nature of light, terminologies and units, Basic laws of illumination, determination of luminous flux, Light sources and their characteristics, Light production by excitation and ionization, Sources of light, Filament lamp, Halogen lamp, Discharge lamp, Fluorescent tube, Compact fluorescent lamp, LED lamp technologies and their applications, Energy considerations, Photometry.

Light Control: Direct, Diffused and Mixed reflection, Reflection factor, Transmission factor, Refractors, Light fittings, Street lighting, Flood lighting, Factory lighting.

Energy Efficient Buildings: Significance of energy efficiency in residential and nonresidential usage, Strategies involved in management of electrical energy consumption at consumer end, Application of adjustable speed drive and Energy efficient motor in energy saving for residential and industrial sector, Variation in lighting energy consumption among different building types, The design of energy efficient lighting scheme, The cost effectiveness of efficient lighting technologies.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. E.O. Taylor, Utilization of Electric Energy, Orient Longman.
2. H. Pratab, Art and Science of Utilisation of Electrical Energy, Dhanpat Rai & Son.
3. Frank Kreith and Ronald E.West, Handbook of Energy Efficiency, CRC Press.
4. C. L. Wadhwa, Generation Distribution and Utilization of Electrical Energy, New Age International.

EE641 Advanced Microprocessors and Microcontrollers [2 0 2 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

1. understand the generalized architecture of advanced microprocessors and advanced microcontrollers
2. develop algorithm/program of the advanced microcontrollers for a particular task
3. interface advanced microcontrollers with external peripherals

Syllabus:
Advanced Microprocessors: Evolution of microprocessors, Advanced microprocessor family overview, Introduction to Harvard architecture, 8086 internal architecture, Pin diagram and function of each pin, 8086 programming model, Memory Segmentation, Generation of Physical address, Concept of queue in 8086.
The ARM Microcontroller: Basic features and comparison of ARM, PIC, AVR, Arduino, Raspberry Pie Microcontrollers, Introduction to ARM microcontroller, Internal architecture, I/O pins, Ports, Timers, Interrupts, Memory organization, Concept of Pipelining, Types of hazards and their solutions.
ARM Microcontroller Programming: Programming model, Instruction classification and format, Addressing modes, Data transfer instructions, Arithmetic instruction, Logical group of instructions, Branching instructions, Assembly language programming of ARM.
Applications of ARM: ADC-DAC applications, PWM applications, MATLAB interface with ARM, Embedded code generation.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References

1. Douglas V.Hall, Microprocessor and Interfacing, Tata McGraw-Hill Education.
2. Barry B.Bray, The Intel Microprocessors Architecture, Programming and Interfacing, Pearson Publications.
3. Steve Furber, ARM System-On-Chip Architecture, Pearson Publications.
4. Rob Toulson and Tim Wilmshurst, Fast and Effective Embedded system design-Applying the ARM, Elsevier.

CH001 Air Pollution Control Engineering [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the fundamentals of air pollution, the major collection mechanism and equipments/instruments for a given gaseous or particulate pollutants
- select and apply the most appropriate air pollution control system
- understand the fundamentals of indoor and odour pollution
- understand different methods for controlling emissions from stationary and mobile sources
- apply the concept of air pollution control engineering to the professional society and general public

Syllabus:
Introduction to Air Pollution : Air pollution in India and the world, sources and classification of air pollutants, global concern of air pollutants, effects of air pollutants.
Meteorological Aspects of Air Pollution: Temperature lapse rates and stability, meteorological factors influencing air pollution, plume behavior, dispersion of air pollutants and estimation of plume rise.
Sampling and Measurement of Air Pollution: Types of pollutant sampling and measurement, ambient air sampling, stack sampling, analysis of air pollutants.
Source Correction Methods: Raw material change, process change, equipment modifications.
Particulate Control Techniques: Collection efficiency, particulate control equipments like gravity settling chambers, cyclone separator, filters, electrostatic precipitator, wet scrubbers.
Control Technologies for Gaseous pollutants: Scrubbers, absorption and adsorption, control of specific gaseous pollutants like SO_x, NO_x.
Control of Volatile Organic Compounds: Environmental significance of organic compounds and its control.
Odor and Its Control Techniques: Sources and characteristics of odor, measurement and control of odor.
Indoor Air Pollution: Indoor air pollutants and its effect, factor influencing indoor air quality, control of indoor air pollutants.
Air Pollution Legislation and Regulations: Air quality criteria and emission standards.
Control of Air Pollutants from Various Sources like Stationary and Mobile source
Recent Trends in Air Pollution Control Techniques

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Richard W. Bouble, Donald L. Fox, D. Bruce Turner, Arthur C. Stern, Fundamentals of Air Pollution, Academic Press.
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International.
3. M N Rao, H V N Rao, Air Pollution, Tata McGraw Hill.
4. J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, I. K. International.
5. S. C. Bhatia, Textbook of Air Pollution and its Control, Atlantic Publishers & Distributors.
6. R. K. Trivedy, P. K. Goel, An Introduction to Air Pollution, BS Publications.

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B Tech Sem V / VI
SS561, Creativity and Innovation

[2 0 0 2]

Course Learning Outcome:

By the end of this course students will be able to:

1. Understand the importance of R directed thinking complementing L directed thinking
2. Infer and discover processes and methods of creative problem solving
3. Enhance and correlate their creative and innovative thinking skills
4. Understand various disruptive innovations and techniques
5. Analyze and apply various tools of creativity to some basic problems

Syllabus:

1. INTRODUCTION:

- Introduction to Creativity and Innovation
- Creativity V/s. Innovation
- Creativity as thinking skill
- Critical Thinking V/s. Creative Thinking
- Lateral Thinking
- Engineering and Creativity
- Creativity in Problem Solving

2. TOOLS FOR CREATIVITY:

- Brain storming
- Mind mapping
- SWOC Analysis
- Fishbone diagram
- Six thinking hats
- Borrowing brilliance
- Da Vinci's seven principles
- Provocation and movement
- Examples and case studies

3. WHOLE NEW BRAIN

- L directed thinking V/s. R directed thinking

- From agriculture age to Industrial age to Information age to Conceptual Age
- Need to high touch – design, story symphony, empathy, play, meaning

4. SKILLS FOR DISRUPTIVE INNOVATORS

- Introduction
- Associating
- Questioning
- Observing
- Networking
- Experimenting
- Putting skills into practice
- Case studies

5. MEDICI EFFECT

- Introduction
- Intersection
- Creating medici effect
- Making intersectional ideas happen
- Case studies

6. TRIZ INNOVATION

- Introduction
- Ideality
- Resources
- Contradictions
- Pattern of innnovation
- Case studies

7. BIO MIMICRY

- Introduction
- Design of various products inspired by nature like Green building, bullet train, Nike Clothing, Velcro, Adhesive Tape, Turbine, self-heating plastic, friction reducing swimming suit, automated robot, screen display, deep blue

8. JUGAAD INNOVATION:

- Introduction
- Jugaad tactics: Seek Opportunities in Adversity, Do more with less, Think and act Flexibly, Keep it simple, Include the margin, Follow your heart.
- Case studies

9. CASE STUDY BY IDEO DESIGN THINKING MODEL

Self-study content will be declared at the commencement of the course. Approximately 10% of the

assessment will be upon this content.

References:

1. Daniel H. Pink, A whole new mind, Pearson publication, New Delhi
2. Benyus, J.M.1997. Biomimicry:Innovation Inspired by Nature, HarperCollins,New York
3. Technical Innovation Center Inc, USA Altshuller G (1997) 40 Principles. TRIZ Keys to Technical Innovation. Technical Innovation Center Inc, USA Andrews P
4. Kelly, Tom (2001): The Art of Innovation, Lessons in Creativity from IDEO, America's Leading Design Firm, Doubleday, NY
5. Tina Seelig, Ingenius, A Crash course on Creativity Hayhouse, U.K
6. Edward de Bono, Lateral Thinking, Be more creative and productive, Penguin India
7. Edward de Bono, Teach Yourself to Think, Penguin India
8. Edward de Bono, Six Thinking Hats, Little Brown and Company
9. Jonah Lehrer, Imagine, How creativity works, Canongate, Edinburgh, London
10. John Adair, The Art of Creative Thinking, Kogan Page India, New Delhi
11. Jeff Dyer, Hall Gregersen & Clayton M. Christensen, The Innovator's DNA, Harvard Business Publishing
12. Daniel Goleman, Emotional Intelligence, Bloomsbury Publishing India P.Ltd.]
13. Howard Gardner, Five Minds for the Future, Harvard Business Review Press
14. Malcolm Gladwell, Blink: The Power of Thinking Without Thinking, Hachette Book Group USA
15. Navi Radjou, Jaideep Prabhu, Simone Ahuja, Jugaad Innovation, Wiley Publisher

Website References:

1. Ideo.com
2. Asknature.org
3. Edwdebono.com
4. Triz40.com

EE622 Dynamics and Modelling of Electrical Machines [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand mathematical model of conventional electrical machines
- apply concept of reference frame theory for various ac machines
- analyze and predict the behavior of electrical machines for various operating conditions

Syllabus:
Basic Principles for Electric Machine Analysis: Magnetically coupled circuits, Electromechanical energy conversion, Machine windings and air-gap mmf, winding inductances and voltage equations.
Reference Frame Theory: Basic concept of reference frame, Equations of transformation: change of variables, Stationary circuit variables transformed to the arbitrary reference frame, Commonly used reference frames, Transformation between reference frames.
Modelling of D.C Machines: Elementary direct current machine, Voltage and torque equations, Dynamic characteristics of various dc machines, Time-domain block diagrams and state equations.
Modelling of Induction Machines: Voltage and torque equations in machine variables, Equations of transformations for rotor circuits, Commonly used reference frames, Per unit system, Voltage and torque equations in arbitrary reference frame variables, Analysis of steady state operation, Free acceleration characteristic viewed from various reference frames, mathematical model / block diagram to predict dynamic response during sudden change in load torque, Concepts of computer simulation in the arbitrary, Stationary, Rotor reference frames.
Modelling of Synchronous Machines: Voltage and torque equations in machine variables, Per unit systems, Stator voltage equations in arbitrary reference frame variables, Voltage equations in rotor reference frame variables: Park's equations, torque equations in substitute variables, Rotor angle and angle between rotors in a system, Dynamic performance during a sudden change in input torque, Dynamic performance during a 3-phase fault at the machine terminals.
Modelling of PM Machines: Introduction, Voltage and torque equation in machine variables and rotor reference frame variables.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Paul C. Krause, Analysis of Electric Machinery, Tata McGraw Hill.

   Bernard Adkins, The General Theory of Electrical Machines, Chapman & Hall Ltd.
2. R. Krishnan, Electric Motor Drives: Modeling, Analysis, and Control, PHI.
3. C.V. Jones, Unified Theory of Electrical Machines, Butterworth Publishers.
4. D. C. White and H. H. Woodson, Electromechanical Energy, Conversion, Tata McGraw Hill.
5. I. P. Kopylov, Mathematical Models of Electric Machines, Mir Publisher Moscow.
6. Ned Mohan, Advanced Electric Drives: Analysis, Control, and Modeling Using MATLAB / Simulink, Wiley.
7. Kimbark E W, Power System Stability, Vol III, Wiley Interscience.

EE602 Electrical Drives and Traction Systems [3 0 2 4]

Course Learning Outcome:

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

1. understand theoretical concepts of dynamics of electric drives
2. analyze the performance of dc motor drives and induction motor drives for various operating conditions
3. estimate energy consumption and decide rating of motor for traction application

Syllabus:

Fundamental of Electric Drives: Basic concepts, Characteristics and operating modes of drive motors, Starting, braking and speed control of motors, Four quadrant drives, Nature and classification of load torque and associated controls used in process industries, Selection of motors and rating.

DC Motor Drives: Starting, braking and speed control, Analysis of separately excited dc motor with continuous armature current and discontinuous armature current, Analysis of dc series motor drives, Comparative evaluation of phase angle control, Semi-converter operation of full converter, Single phase half controlled and fully controlled rectifier fed dc motors, Sequence control, Three phase half controlled and fully controlled rectifier fed dc motors, Dual converter with circulating and non-circulating current controlled drives, Closed loop control system of dc motor drives, Reversible drives, Analysis and performance characteristics of chopper fed dc motors, Motoring and braking operations, Multiphase chopper, Phase locked loop control of dc drive.

Induction Motor Drives: Operation with unbalanced source voltages and unbalanced rotor impedances, Effect of time harmonics on the motor performance, Braking, Stator voltage control of induction motor, Variable voltage variable frequency (VVVF) operation, Voltage source inverter (VSI) fed induction motor drive, Static rotor resistance control, Slip power recovery systems, closed loop control of ac drives, Introduction to field oriented control of ac motors, Comparison of ac and dc drive, Their selection for particular application.

Electric Traction: General features of electrical traction, Mechanics of train movement, Nature of traction load, Speed-time curves, Calculations of traction drive rating and energy consumption, Train resistance, Adhesive weight and coefficient of adhesion, Tractive effort for acceleration and propulsion, Power and energy output from driving axles, Methods of speed control and braking of motors for traction load, Electric drive systems for electric traction.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. G. K. Dubey, Fundamental of Electrical Drives, Narosa Publication.
2. B.K. Bose, Power Electronics & Variable Frequency drive, IEEE press.
3. S. K. Pillai, First Course on Electrical Drives, Wiley Eastern Limited.
4. V. Subramanyam, Electric Drives– concepts and applications, Tata McGraw Hill.
5. H. Partab, Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Sons.
6. G. C. Garg, Utilization of Electrical Power and Electrical Traction, Khanna Publication.

Department Elective - I

EE611 Electronic System Design [2 0 2 3]

Course Learning Outcome:
After successful completion of this course, students will be able to

1. understand practical design aspects of component used in power electronic converters
2. investigate the various output waveforms with necessary troubleshooting
3. design and fabricate hardware for various applications

Syllabus:
Design of Power Supplies: IC based linear power supplies, Switched mode power supply topologies - forward, Fly back, Push – pull, Bridge, SMPS IC's, Magnetic component requirement and design, Filter design, Voltage regulation, Load regulation, EMI/EMC considerations, Design of PI controller.
Design of Inverter: Design of driver circuit with isolation and protection for single phase half – bridge inverter and full-bridge inverter, PWM circuit design for single – phase and three – phase inverter, Power circuit design, Protection circuit needs and heat sink design, Selection of ratings of components and power devices, Signal sensing and its conditioning.
Design of UPS system: Type of UPS, Battery charger design, Selection of battery bank, Ah capacity, Back – up time, Topologies of UPS, Redundancy, Bypass mechanism, Controller features, Harmonics at supply side and load sides, Applications.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 05 experiments to be incorporated.

References:

1. M. Rashid, Power Electronics Circuits and Applications, Pearson Education.
2. L. Umanand, Power Electronics Essentials and Applications, Wiley India Pvt. Ltd.
3. Abraham Pressman, Switching Power Supply Design, McGraw Hill professional.
4. David A. Bell, Operational Amplifiers and Linear ICs, Oxford University press.

EE632 Extra High Voltage Transmission [3 0 0 3]

Course Learning Outcome:
After successful completion of course, student will be able to

- critically evaluate high voltage ac and dc system with all aspects
- design of transmission line with all aspects
- visualize behavior of transmission system under different conditions

Syllabus:
Introduction: Comparison between ac and dc transmission systems, Transmission line trends, Importance of EHV transmission. **Skill Development**
Alternating Current Transmission: Choice of voltage and configuration, Problems associated with EHV ac transmission, Need of long distance EHV line, Stability of long EHV line, Transmission line parameter measurement and calculations, Corona and its effects like power loss, Radio interference, Audible noise, Reactive power management, Electrostatic and electromagnetic fields due to EHV lines and its effect, Various electrical, mechanical and civil design aspects of EHV transmission lines, Use of FACTS devices in EHV Transmission. **Employability and Skill Development**
Direct Current Transmission: Types of dc links, Different types of converter circuits, Greatz circuit and its complete analysis, Causes of overlapping, Importance of extinction angle, Power factor and reactive power of converters, Comparison between constant current and constant voltage system, Constant current control with supplementary control, Constant ignition angle control, Constant extinction angle control, Concept of mode stabilization and VDCOL, Harmonic analysis, Multi terminal dc systems, Measurement of transmission line parameter, Faults and protection aspects of dc systems, Basic design of hvdc link, Introduction to VSC based dc system, CIGRE benchmark model study. **Employability and Skill Development**
Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Rakosh Das Begamudre, Extra High Voltage Transmission Engineering, New Age Publishers.
2. K. R. Padiyar, HVDC Power Transmission Systems, New Age Publishers.
3. Vijay K. Sood, HVDC and FACTS Controllers, Kluwer Academic Publications.
4. E. W. Kimbark, Direct Current Transmission (Vol-I), Wiley & Sons.
5. Central Station Engineers of Westinghouse Corporation, Electrical Transmission and Distribution Reference Book, 1964.

EE604 Mini Project-II [0 0 2 1]

Course Learning Outcome:

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

1. practice acquired knowledge within the chosen area of technology for project development
2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:
product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

EE621 Permanent Magnet Brushless and Reluctance Motors [2 0 2 3]

Course Learning Outcome:

After successful completion of course, student will be able to

1. analyse properties and applications of Permanent Magnet (PM) materials
2. understand constructional aspects, operational aspects and characteristic of brushless PM and reluctance motors
3. analyse brushless PM and reluctance motors with application point of view

Syllabus:

Permanent Magnet Material and Magnetic Circuits: Electrical properties, B-H loop and demagnetization characteristics, Temperature effects, Mechanical properties, Various applications.

Permanent Magnet Brushless DC (PMBLDC) Motor: Features, Comparison with conventional dc motors, Construction and operating principle, Equivalent magnetic circuit, Surface permanent magnet (SPM) rotor, Interior permanent magnet (IPM) rotor, EMF equation, nature of back EMF generated and sensing technique, Derivation of torque equation, characteristics and control, Different types of converters.

Switched Reluctance Motor (SRM): Features, Construction and operating principle, Equivalent magnetic circuit, Inductance profile, Static torque production, Selection of number of poles and pole arcs, Partition of energy and the effects of saturation, Dynamic torque production, Characteristics and control, Different types of converters.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. T.J.E. Miller, Brushless PM and Reluctance Motor Drives, Clarendon Press Oxford.
2. Hanselman D., Brushless Permanent-magnet Motor Design, McGraw Hill.
3. Jacek Gieras, Permanent Magnet Motor Technology: Design and Applications, CRC Press.
4. R. Krishnan, Electric Motor Drives, PHI Publishers.
5. Kelly Denis, Performance and Control of Electrical Machines, Tata McGraw Hill.

Semester VI

EE601 Power System Operation and Control [3 1 2 5]

Course Learning Outcome:
After successful completion of the course, student will be able to

- network matrices and determine the load flow solution using iterative methods
- distinguish various stability aspects and analyze their effects on the performance of power system
- suggest economic dispatch of load between generating stations
- analyze the effect of load variation on the frequency of the power system network

Syllabus:

Formation of Network Matrices: Bus impedance and bus admittance matrices, Algorithm for formation of Z-bus and Y-bus matrices, Modification of bus impedance matrix, Matrix sparsity, ersions for Y-bus.

Load Flow Study: Introduction, classification of buses, load flow problem and its solution techniques, various constraints, static load flow equations (SLFE), Gauss method, Gauss-Seidel method, Newton- thod, Fast decoupled method, Comparison of different methods.

udies: Introduction, Classification, Power angle characteristics, Stability limits, Dynamics of synchronous machines, Swing equation, Synchronizing coefficient, Equal area criterion and its Numerical solution of swing equation, Factors affecting steady state and transient

Economic Operation of Power System: Economic operation of generators, Transmission loss as a function of plant generation, Economic distribution of load between the plants coordinating transmission losses, Kron's method of evaluating loss coefficients, Penalty factor, Economic dispatch, Schemes of load dispatching.

Load Frequency Control: Introduction, Single area load frequency control, Modelling of speed governing system, Turbine and generator, Steady state analysis, Dynamic response, Proportional plus integral control, Load frequency control and economic load dispatch control, Principle of frequency control.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

utorial Work:
Tutorial work will be based on above syllabus with minimum 08 tutorials to be incorporated.

References:

1. D.P. Kothari and I. J. Nagrath, Modern Power System analysis, McGraw Hill.
2. S. S. Vadhera, Power System Analysis and Stability, Khanna Publishers.
3. S. Sivanagaraju and G. Sreenivasan, Power System Operation and Control, Pearson.
4. John Grainger and W. D. Stevenson, Power System Analysis, McGraw Hill.
5. T. K. Nagsarkar and M. S. Sukhija, Power System Analysis, OxfordUniversity Press.
6. B. R. Gupta, Power System Analysis and Design, S. Chand & Co.

EE631 **Renewable Energy Sources** **[2 0 2 3]**

Course Learning Outcome:

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

1. apply the concepts of renewable energy sources for electricity generation
2. apply the concepts of grid integration with renewable sources
3. evaluate the options and estimate the energy generation through renewable sources

Syllabus:

Energy Sources: Conventional, Non-conventional, Renewable and non-renewable sources, Statistics of resources and data on different sources in world and in India, Significance of renewable sources and their exploitation, Concepts of reactive power generation and absorption, Techno – commercial aspects of various renewable technologies.

Solar Thermal System: Solar radiation, Solar radiation collectors, Applications, Solar power plants, Types of solar thermal power plants and their integration with grids, Comparison with conventional thermal power plants.

Solar Photovoltaic System: Characteristics, PV panels, Characteristics of motors connected to PV set, MPPT and its requirement, Grid connected systems, Various applications of Solar PV system.

Wind Energy System: Working principles, System configuration, Limitations, Effects of wind speed on grid conditions, Grid independent systems like wind-battery, Wind-solar-battery, Wind-diesel, Wind-hydro-biomass etc., Wind operated pumps, Controller for energy balance, Grid connected systems.

Small Hydro System: System configuration, Working principle, Limitation, Effect of hydro potential, Grid connected system, Synchronous versus induction generator for standalone systems.

Ocean Energy System: Different schemes: OTEC, wave energy & tidal energy, System configuration, Grid connected and hybrid systems.

Biomass Energy System: System configuration, biomass engine driven generators feeding loads in stand-alone or hybrid modes.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

- G. D. Rai, Non-conventional energy sources, Khanna Publishers.
- B. H. Khan, Non-Conventional Energy Resources, Tata McGraw Hill.
- G. S. Sawhney, Non-Conventional Energy Resources, PHI learning.
- Joshua Earnest, Wind Power Technology, PHI learning.
- Chetansingh Solanki, Solar Photo Voltaics: Fundamentals, Technologies and Applications, PHI learning.

EE603 Testing, Commissioning and Maintenance of Electrical Equipment[2 0 2 3]

Course Learning Outcome:

After successful completion of course, student will be able to,

- perform testing of various electrical equipment as per standard procedure and analyze results
- understand the process of commissioning
- appreciate and evaluate various maintenance methods / techniques
- suggest the remedial action to improve life of electrical equipment

Syllabus:

Introduction: Overview of maintenance schemes, Types of tests, Different class/types of insulations, Condition monitoring of electrical equipment, Basics of remnant life analysis, Different standards for electrical equipment testing.

DC and AC Testing of Insulation of Electrical Equipment: Introduction to dc and ac testing, Comparison between ac and dc testing, Concepts of ac - dc testing of motors, Generators, cables, Transformers, Insulator, bushing, Lightning arrester, Basic understanding of various types of modes in power factor testing, Analysis of results.

Testing, commissioning and maintenance of Rotating Machines: Different tests for ac, dc, Synchronous machines, Type and class of stator and rotor winding insulations, Winding failures, Stator failure mechanisms and remedies, Rotor winding failure mechanism and remedies, In-service monitoring of stator and rotor windings, Slot discharge and partial discharge test, Frequency test, Special care for variable frequency drive (VFD) fed motors, Efficiency calculation as per IS, Commissioning and troubleshooting in rotating machine, Drying out methods, Maintenance procedures.

Testing, commissioning and maintenance of Transformer: Transformer tests: transformer turns ratio (TTR) test, Polarity test, Induced potential test, Core - ground test, magnetic balance test, Polarization recovery test, Separate source voltage test, Power frequency test on windings, Impulse test, Short circuit test, Zero sequence test, Noise level test, latest trends in transformer health monitoring - dissolve gas analysis (DGA), Furan analysis, Frequency response analysis, Transformer transportation issues, Commissioning process, General maintenance procedures.

Trends in condition monitoring: Need of condition monitoring, Off – line and online monitoring, Signature analysis, Non-electrical methods e.g. thermography, Acoustic measurements, Chemical analysis etc.

Self study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. S. Rao, Testing, Commissioning, Operation and Maintenance of Electrical Equipment, Khanna Publications.
2. Paul Gill, Electrical Power Equipment Maintenance and Testing, CRC Press.
3. G. C. Stone, E. A. Boulter, I. Culbert and H. Dhirani, Electrical Insulation for Rotating Machines, IEEE Press, Wiley Interscience.
4. Indrajit Dasgupta, Power Transformers Quality Assurance, New Age Publishers.
5. Prevalent standards, product literature and manuals.

EE734 Advanced Electrical Power System [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the concepts of preventive, emergency and restorative control of power system
- forecast the loading and estimate the operating state of power system
- analyze and determine the voltage stability of a power system

Syllabus:

Load Forecasting Techniques: Introduction,Load forecasting, Load forecasting techniques, Estimation of average and trend terms of deterministic part of load, Estimation of stochastic part of load.

……..**Skill Development**

State Estimation of Electrical Power System: Introduction, Basic methods of state estimation, State estimation from non-linear measurements, Static state estimation for power systems, State estimation process in power systems, Consideration of computational aspects, External system equivalencing, Bad data in measurement vector, Network observability, Application of power system state estimation.

……..Skill Development

Voltage Stability Analysis: Definition and classification of voltage stability, Mechanism of voltage collapse, Analytical concept and expression of voltage stability limit for a two-bus system, Factors affecting voltage stability, Voltage stability of non-linear power system, Computation of voltage collapse point, Role of transformer on voltage control of a power system, Methods for enhancing voltage stability,

……skill development

Determination of voltage stability using - Sensitivity Indicator, Voltage Security Indicator, Q-V modal analysis and Optimal power flow technique. Skill Development

Preventive, Emergency and Restorative Control: Introduction, Normal and alert state in a power system, Emergency control, Blackout, Power system restoration.……Skill Development

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- A. Chakrabarti and S. Halder, Power System Analysis Operation and Control, PHI.
- D.P. Kothari and I.J. Nagrath, Modern Power System Analysis, McGraw Hill.
- S. S. Vadhera - Power System Stability and Control, Dhanpat Rai.
- J. J Grainger and W. D Stevenson Jr., Power System Analysis, McGraw Hill.
- B.R Gupta, Power System Analysis and Design, S. Chand.
- A. Chakrabarti, M. L. Soni, P. V. Gupta and U. S. Bhatnagar, A Textbook on Power System Engineering, Dhanpat Rai & Co.

EE713 Application of Power Electronics in Power System [2 0 2 3]

Course Learning Outcome:
After successful completion of course, student will be able to

1. understand various types of FACTS (Flexible AC Transmission Systems) controllers and their applications
2. investigate and suggest solution for various power quality issues
3. appreciate the role of power electronics in power systems
4. apply the power electronic converter for given power quality issues

Syllabus:
Introduction: Importance of reactive power with brief discussions on transmission line theory, Need for load compensation, Load balancing using passive elements and their limitations, Compensation for constant voltage, Compensation for unity power factor.
Shunt FACTS Controllers: Objectives of shunt compensation, Methods of controllable VAR generation, Use of VSI (Voltage Source Inverter) as a VAR generator, Role and technical understanding of SVC (Static VAR Compensator) and STATCOM (Static Compensator).
Series FACTS Controllers: Objectives of series compensation, Variable impedance type series compensators – TCSC (Thyristor Controlled Series Capacitor), Role of SSSC (Static Synchronous Series Compensator), Various issues related to series compensation.
Combined Compensators: Basic operating principle of UPFC (Unified Power Flow Controller) and IPFC (Interline Power Flow Controller) with their control capabilities.
Power Quality Issues and Solutions: Classification of linear and nonlinear loads, Different power quality problems, Generation and classification of harmonics, Harmonics mitigation techniques, Introduction to active and passive power filters, Detailed analysis of active power filter, Understanding of IEEE harmonic standard 519-1992.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10 % of the questions will be asked from self-study contents.

Laboratory Work:
This shall consist of at least 08 laboratory experiments based on the syllabus.

Reference Books:

1. N. G. Hingorani - Understanding FACTS: Concepts And Technology of Flexible AC Transmission Systems, IEEE Computer Society Press
2. T.J.E. Miller - Reactive Power Control in Electric Power Systems, John Wiley & Sons, New York
3. R. Mohan Mathur and Rajiv K. Varma – Thyristror based FACTS Controllers for Electrical Transmission Systems, IEEE Press, Wiley Interscience

4. K. R. Padiyar – FACTS Controllers in Power Transmission and Distribution, New Age International

5. Song Y. H. and A. T. John – Flexible AC Transmission Systems, IEE Press, London
6. J. Arrillaga, Y. H. Liu and N. R. Watson – Flexible Power Transmission: The HVDC Options, Wiley
7. R. Sastry Vedam and M. S. Sarma – Power Quality VAR Compensation in Power Systems, CRC Press
8. G. T. Heydt – Electric Power Quality, Stars in a Circle Publications
9. A. R. Bergen and V. Vittal – Power System Analysis, Prentice Hall
10. N. Mohan, T. M. Undeland and W. P. Robbins – Power Electronics: Converters, Applications and Design, Wiley
11. Recent Journal Papers and literature available in various industry documents

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B Tech Sem - VII/VIII
2HS016, Applied Literature

[3 0 0 3]

Course Learning Outcome
Students completing this subject will:

- ✓ be able to explore the importance of textual traditions in shaping responses to other places, peoples, cultures;
- ✓ gain a knowledge and understanding of the social, political and intellectual forces contributing to imperial, third world and migrant writing;
- ✓ develop a knowledge and appreciation of the subject matter, styles and narrative conventions

Syllabus

Non-fictional Prose Works (Excerpts)

New Branded World by Naomi Klein
From the Gutenberg Elegies: The Fate of Reading in the Electronic Age by Sven Birkets
Decolonising the Mind by Ngugi wa Thiong'o
Idea of India by Sunil Khilnani
Wings of Fire by APJ Kalam

Poems

Night of the Scorpion by Nissim Ezekiel
Little Red-Cap, by Carol Ann Duffy
Hunger by Jayanta Mahapatra
The Dacca Gauzes by Agha Shahid Ali
The Howl by Allen Ginsberg
If you forget me by Pablo Neruda
Still I rise by Maya Angelou
If by Rudyard Kipling
"Hope" is the thing with feathers by Emily Dickinson
All You who Sleep Tonight by Vikram Seth
The Unknown Citizen by W. H Auden
Song of Myself, I, II, VI & LII by Walt Whitman

Short Stories

Short Story: “Seventeen Syllables” by Hisaye Yamamoto

Short Story: “The Gift of the Magi” by O. Henry

Criticism

Towards a Feminist Poetics by Elaine Showalter

Movies

The Prestige

To Sir, With Love

The Namesake

Sherlock – TV series

Troy

Jobs

References:

- Widdowson, Peter. *Literature*. London: Routledge, 1999.
- Miller, J. Hillis. *On Literature: Thinking in Action*. London: Routledge, 2002.
- Mulhern, Francis, *Culture/Metaculture*. London: Routledge, 2000.
- During, Simon, *The Cultural Studies Reader*. London: Routledge, 1993.
- Leitch, Vincent B. *The Norton Anthology of Theory and Criticism*. Norton: New York, 2001.
- Stam, Robert; Alessandra Raengo, *A Companioin to Literature and Film*. Blackwell: Oxford, 2004.

Nirma University
Institute of Technology
B.Tech
2HS014, Banking & Finance

[3 0 0 3]

Objective: To understand the various concepts of banking and financial system

Indian Financial System: The Financial System, Nature, Evolution and Structure, the Functions of Financial Intermediaries, Financial Instruments, the Role of Financial System in Economic Development, the Indian Financial System. The Origin and Growth of Banking of Banking, Functions of Commercial Banks,, Banking in the New Millennium.

Banker Customer Relationship: Types of Accounts, Types of Relations, KYC Norms, Banker – Customer relationship, Rights and Duties of Banker/ Customer, Importance provisions of NI Act

Sources &Uses of Funds: Bank Balance sheet, Sources & Uses of Funds in a Bank. Form of Balance Sheet of Banking Companies. Different Schedule under Banking Regulation Act. – Provisioning norms of CRR & SLR

Deposit Management: Importance of Deposit, Types of Deposit in India, USA & Europe. NRI Deposits, Cost of Deposit & its impact on Profitability, concepts of Fixed & Floating Rate of Interest, Deposit Insurance.

Cheques: Special Features Negotiability, Validity, Crossing & Endorsement.

Cash Management: Importance of Cash Management issues, Cash at Counter, Vault & Currency Chest.

Lending Activities : Lending activity, Basic requirements for lending.

Credit Policy: Need for Credit Policy, Components of Credit Policy, Credit Policy Pursued by the Government, Bench Marks Exposure Norms, Credit Culture.

Retail Banking: Basics of Retail Banking, Forms of Retail Banking and Emerging issues

Corporate Banking: The nature of corporate banking, Developments in corporate banking, Consortium finance, Multiple banking arrangements, and Loan syndication

Feebased Services: Feebased Services L/C,B/G, Subsidary services, Bancassurance, Demat Account, Safe Deposit Locker , Mutual Funds, Merchant Banking Activities – Management of Public issues, Reasons, Eligibility norms, Regulatory framework, Marketing of issues, Post issue activities

Plastic Money: Different types of plastic money, Concept of a credit card, Distinction between Credit card, Charge card and Debit card, Mechanics of a credit card transaction, Credit card as an augmented retail financial product, Credit card business in India, The merging scenario CRM, (AWB, ATM, Mobile Banking Internet Banking) Delivery Channels (Payment & settlement services)

Reference Books:

- Management of Banking & Financial Services - Paul, Justin / Suresh, Padmalatha. Pearson – 2007
- Financial Institutions and Markets, 4th e Bhole, LM. Tata McGraw Hill 2004
- Indian Financial System, Theory and Practice, 4th e, Khan, M Y. Tata McGraw Hill 2004

EE733 Computer Techniques in Power System [2 0 2 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

- employ and develop computer techniques to determine various power system studies and analyze the same
- develop the mathematical model for economic load dispatch and prepare the unit commitment schedule
- understand and analyze contingency & security studies

Syllabus:

Load Flow for AC Systems: Introduction to computer programming for Gauss Siedel method, Newton Raphson (N – R) method, Fast decoupled load flow, Optimal power flow**…….skill development**

Computer- Aided Economic Load Dispatch: Introduction, Economic load dispatch by N-R method, Using exact loss formula, Using loss formula which is a function of real and reactive power, Economic load dispatch for real and reactive power balance.

Unit Commitment: Introduction, Constraints of unit commitment, Priority list method, Dynamic programming method of unit commitment, Lagrange Relaxation method. ……..….skill development

Contingency and Security studies: Introduction, Approximations in contingency analysis, Addition and removal of multiple lines in power systems, Concepts of current injection distribution factor and line outage distribution factor, Single line contingency, Multiple line contingency, Contingency analysis of Interconnections, Power system security, Algorithm to determine system security following contingency analysis procedure.……Skill development

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 practical based on the above syllabus.……...skill development

References:

1. A. Chakrabarti and S. Halder, Power System Analysis, Operation and Control, PHI.
2. O. I. Elgerd, Electric Energy Systems Theory, McGraw Hill.
3. G.W.Stagg and A.H. El-Abiad, Computer Methods in Power System Analysis, McGraw Hill.
4. L. Kusic, Computer Aided Power Systems Analysis, Prentice Hall.
5. I. J. Nagrath and D. P. Kothari, Modern Power Systems Analysis, Tata McGraw Hill.

- A. J. Wood and B. F. Wollenberg ,Power Generation, Operation and Control, John Wiley.

New course has been added for semester 7 in elective pool from power system area with lab component.

EE724 Control of Electric Drives [3 0 0 3]

Course Learning Outcome:
After successful completion of this course, students will be able to

- understand control aspects of electric drives
- select appropriate control strategy for given application
- integrate schematic blocks to control electric drives
- analyze performance of electric drives

Syllabus:
DC Motor Drive: Various schemes of closed loop control using sensors, Sensorless operation of drive, DC motor drive using PWM rectifiers.
Induction Motor Drive: Principles of soft starting, Loss minimization, Various schemes of closed loop control, Direct and indirect field oriented control of induction motor, Direct torque control.
Switched Reluctance Motor Drive: Various converter configurations, Modified converter topology, Control strategies, Sensor and sensorless control of SRM, Reduction of torque pulsation.
Brushless Motor Drive: Fundamentals of permanent magnet motors, Control strategies, Vector control of the Permanent Magnet Motor drive, Direct torque control of Permanent Magnet Motor drive, Sensorless control, Reduction of torque pulsations, Parameter sensitivity of drive.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. G. K. Dubey, Power semiconductor controlled drives, Prentice-Hall.
2. P. Vas, Vector control of AC machines, Clarendon Press, Oxford.
3. B. K. Bose, Modern Power Electronics & AC Drives, Prentice-Hall.
4. T. J. E. Miller, Brushless PM and Reluctance Motor Drives, Clarendon Press, Oxford.
5. Latest publications from Journals and renowned conferences.

2ME004 **Cryogenics** **[3 0 0 3]**

Course Learning Outcome:
After successful completion of the course, student will be able to

- describe various methods to produce low temperature and phenomena at cryogenic temperature.
- understand the working principle of different cryogenic refrigeration and liquefaction system.
- understand the functions and working principles of insulations and various low temperature measuring and storage devices.
- understand the application of cryogenic technology in engineering research and industry.

Syllabus:
Low Temperature Properties – Mechanical, thermal, electrical and magnetic properties of engineering materials, properties of cryogenic fluids.
Gas Liquefaction Systems – Thermodynamically ideal system, Joule Thomson effect adiabatic expansion, simple, pre-cooled and dual pressure Linde Hampson systems, Claude system, Kapitza system, Heylandt system, other liquefaction system using expanders, comparison of liquefaction systems, liquefaction systems for hydrogen and helium
Cryogenic Refrigeration Systems – Ideal isothermal and isobaric source systems, Joule Thomson systems, pre-cooled Joule Thomson system, expansion engine system, Philips refrigerator, G M refrigerator, Pulse Tube refrigerator.
Measurement Systems for Low Temperatures – Temperature, pressure flowrate and liquid level measurement at low temperatures.
Cryogenic Fluid Storage – Basic storage vessel, construction of storage vessels for oxygen, hydrogen, nitrogen, helium, safe devices, drawing of the vessel.
Insulations – Gas filled powder and fibrous, vacuum, evacuated powder and fibrous, multiplayer insulations, mechanism of thermal insulation, apparent thermal conductivity, and selection of insulation
Cryogenic Fluid Transfer Systems – Different types of transfer lines, process of cryogenic transfer, components of transfer lines.
Application of Cryogenic Systems – Super-conducting bearing, motors, super-conducting magnets, space technology, blood and tissue preservation, cryo probes used in cryo surgery.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. R.F. Barron,Cryogenics systems, Mc Graw Hill Publication.
2. T.Flynn, Cryogenic Engineering, Springer Publication

EE723 Design of Permanent Magnet Brushless and Reluctance Motors [2 0 2 3]

Course Learning Outcome:

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

- understand and apply design aspects of permanent magnet brushless and reluctance motors
- select appropriate material for design of permanent magnet brushless and reluctance motors
- design permanent magnet brushless and reluctance motors
- estimate and analyze performance of permanent magnet brushless and reluctance motors

Syllabus:

Permanent Magnets: Permanent magnets and magnetic circuit, Selection of type of permanent magnet, Approximate calculation of flux, Latest trends in magnet technology.

Permanent Magnet Brushless Motor: General introduction, Back emf & force, Emf constant, Torque constant, Performance characteristics, Rotor variations, Stator variations, Design considerations, Basic sizing rules, Slotted stator design, Rotor design, Performance estimation.

Switched Reluctance Motor: General introduction, Magnetic equivalent circuit, Calculation of aligned inductance and unaligned inductance, Performance characteristics, Design considerations, Basic sizing rules, Stator design, Rotor design, Performance estimation.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of minimum 5 design/simulation exercises based on the above syllabus.

References:

1. T. J. E. Miller, Brushless PM and Reluctance Motor Drives, Clarendon Press Oxford.
2. D. C. Hanselman, Brushless Permanent Magnet Motor Design, McGraw Hill.
3. R. Krishnan, Switched Reluctance Motor Drives, CRC Press.
4. Latest publications from IEEE Transactions on Magnetics and IEEE Transactions on Industrial Electronics.

EE702 Digital Signal Processors for Electrical Engineering [2 0 2 3]

Course Learning Outcome:

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

4understand and appreciate the importance of architecture, memory and various instruction sets used in digital signal processers for various electrical applications

5initialize and perform basic coding in DSP for various electrical applications

6apply the knowledge of interfacing hardware and software for real time systems

Syllabus:

Introduction to Programmable DSPs: Numeric representation & arithmetic, Fixed point versus floating point, Fixed point data paths & floating point data paths, Multiple access memory, Multi-ported memory, VLIW architecture.

Architecture of TMS320C2XX: Introduction, Bus structure, Central arithmetic logic unit, Auxiliary register ALU, Status register, Index register, Parallel logic unit, Program flow, Memory mapping, CPU interrupts.

TMS320C2XX Programming: Assembly language syntax, Addressing modes, Load/store, Addition/Subtraction, Multiplication, Program control instruction, Sample programs.

Initializing TMS320C2XX DSP: Overview of compilers and emulators, Using code composer studio, Creating and customizing program and data memory, Creating header files, Initializing timers and initialization of internal ADC, Scaling of ADC signals.

Programming and Signal Generation using TMS320C2XX DSP: Implementation of mathematical models on DSP, Customizing and initializing dead band registers, Generation of signals and waveforms, Generation of PWM signals, Various electrical applications.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 08 simulations / practical based on the above syllabus.

References:

1H. Toliyat, - DSP based Electromechanical Motion Control, CRC Press.

2Phil Lapslay - Processor Fundamentals: Architecture and Features, Wiley India.

3Texas Instruments, TMS320C2xx DSP CPU and Instruction Set Reference Guide.

4S. K. Mitra - Digital Signal Processing: A Computer Based Approach, Tata McGraw-Hill.

5B. Venkataramani, M. Bhaskar - Digital Signal Processors: Architecture, Programming and Applications, Tata McGraw-Hill.

2EC005 DIGITAL SYSTEM DESIGN

[3 0 0 3]

MSI & LSI circuits and their Applications: Introduction, Examples of Useful Digital Circuits, Arithmetic Circuit, Comparators, Multiplexers, Code Converters, Wired Logic, Practical Aspects of Wired Logic and Bus Oriented Structures.

Sequential Machines: Types of sequential Machines: Mealy and Moore Machine, Counter Design Using Sequential Machines, State Reduction, Multimode Counters, Sequence Detectors, Timing and Triggering Consideration, Clock Skew.

System Controllers: Use of MSI Decoders and MSI Multiplexers in system Controllers, ROM, PROM, PLA in System Controllers, Concepts of a Programmable System Controller, RTL Description of Simple Machine, Design From RTL description.Hardware Description Languages (HDL), HDL based design; Introduction to data path and control path synthesis;

Asynchronous Finite state machine: Asynchronous Analysis, Design of Asynchronous Machines, Cycles and Races, Hazards, Essential Hazards Considerations of technology; testability and fault-tolerance in design.: Architecture of FPGA and CPLD & its Programming.

Term Work:

Term work will be based on the topics covered in the syllabus

Text\Reference books:

William I. Fletcher - An Engineering Approach To Digital Design, PHI

C. Roth, Digital System Design Using VHDL, Thomson Publication

CL001 **Disaster Risk Management** **[3 0 0 3]**

Course Learning Outcome:

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

1. develop understanding about concept of risk, vulnerbility and disasters
2. select and apply tools & techniques for disaster risk assessment
3. comprehend role of Engineers from various Engineering branches for disaster risk management
4. develop ability for contributing to resilient societies through skills, methods and tools pertaining to disaster risk management

Syllabus:

Introduction to Disaster Risk Management (DRM): Concept, Types of Disasters, Linkages between Disasters and Development, Importance & Significance of DRM.

Risk and Vulnerability: Risk, Vulnerability, Risk Assessment, Disaster Risk Modelling; Emerging Risks due to Development, Climate Change Adaptation, etc.

Disaster Risk Management: Phases, Mitigation, Preparedness, Prevention, Response, Relief and Recovery, Humanitarian Assistance, DM Institutional Framework, Incident Command System, Disaster Management Plan,

Community Based Disaster Management (CBDM): Concept of CBDM, Community Health and Safety, Do's and Don'ts before, during and after disasters.

Disaster Communication: Disaster Communication, Early Warning and Disaster Monitoring, Role of GIS and Remote Sensing in Disaster Risk Management.

Role of Enginners from various branches in Disaster Risk Management: Use of Skills, Methods, Tools and Techniques for understanding the challenges and determining solutions for DRM and Climate Change Adaptation.

Disaster Risk Management Programmes: DRM Programmes, Practices and Case Studies.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- Sahni Pradeep, Ariyabandhu Madhavi Malalgoda, Disaster Risk Reduction in South Asia, PHI Learning Pvt.Ltd.
- Sinha Prabhas C., Disaster Relief: Rehabilitation and Emergency Humanitarian Assistance, SBS Publishers.
- Wisner Ben, Blaikie Piers, Cannon, Terry & Davis, Ian, At risk natural hazards, people's vulnerability and disasters, Routledge.
- Singh R.B. (Ed.), Natural Hazards and Disaster Management Vulnerability & Mitigation, Rawat Publications.
- Blodgett Robert & Keller Edwards, Natural Hazards: Earth's processes as hazards disasters and catastrophe, Pearson Prentice Hall

2EE404: ELECTRIC DRIVE SYSTEMS **[3 - 2 4]**

Fundamental of Electric Drives: Basic concepts, characteristics and operating modes of drive motors, starting, braking and speed control of motors, four quadrant drives, nature and classification of load torque and associated controls used in process industries, selection of motors and rating.

DC Motor Drives: Analysis of separately excited dc motor with continuous armature current and discontinuous armature current, analysis of series dc motor drives, comparative evaluation of phase angle control, semi-converter operation of full converter, single phase half controlled and fully controlled rectifier fed dc motors, sequence control, three phase half controlled and fully controlled rectifier fed dc motors, dual converter with circulating and non-circulating current controlled drives, closed loop control system of dc motor drives, reversible drives, analysis and performance characteristics of chopper fed dc motors, motoring and braking operations, multiphase chopper, phase locked loop control of dc drive.

Induction Motor Drive: AC motor operation with non–sinusoidal supply waveform, variable frequency operation, principles of variable frequency operation, steady state performance at constant v/f, constant flux operation, constant current operation, transient performance of the frequency controlled induction motor, closed loop control of ac drives, closed loop circuits for stator voltage control, v/f control, slip power recovery control, static rotor resistance control, introduction of field oriented control of ac motors, open loop vector control of induction motor, comparison of ac & dc drive, their selection for particular application, effect of non-sinusoidal wave form on ac machine performance.

Synchronous Motor Drives: Three phase synchronous motors, variable speed drives, variable frequency control, self-controlled synchronous motor drive employing load commutated thyristor inverter, self controlled synchronous motor drive employing a cyclo-converter.

1.1.1.1Stepper motor drives: Different types of stepper motors, drive circuits for stepper motors.

Introduction to Advanced Electrical Machines viz. brushless D.C. machines and switched reluctance motors

Laboratory Work:

This shall consist of at least 10 practicals/ Simulations based on the above syllabus./

Text Book:

1. G. K. Dubey - Fundamental of Electrical Drives, Narosa Publication, 2nd Ed. 2001

Reference Books:

1. B.K. Bose - Power Electronics & Variable Frequency drive, IEEE press, 1st Ed 1996
2. S. K. Pillai - First Course on Electrical Drives, Wiley Eastern Limited, 2nd Ed. 1989
3. V. Subramanyam - Electric Drives– concepts and applications, Tata McGraw Hill, 1st Ed. 1996
4. W. Leonhard - Control of electric drives, Springer verlag, 3rd Ed. 2001
5. R. Krishanan - Electric motor drives, Prentice Hall India., 1st Ed. 2001

EE744 Electric Vehicles [3 0 0 3]

Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1compare electric vehicles with fossil fuel driven vehicles and comprehend the basics of vehicle mechanics,

2analyse the fundamental electrochemistry of battery and sustainability of advanced energy storage systems,

3select suitable motor and understand the drive train of electric vehicles,

4gain broad knowledge of hybrid vehicles, networks, communications, actuators and controls used in modern automotive systems.

Syllabus: **Unit-0Course Description**The course gives the elementary idea to aspiring students about the growing concern of environmental protection and sustainable development. It covers the fundamentals of electric vehicles, energy storage, transmission, propulsion and hybrid electric vehicles. The course provides a pathway to shape one's career in the field of future transportation using electric vehicles. **Unit-1Electric Vehicle Fundamentals**Introduction, electric vehicle development – past, present and future, electric vehicles and environment, comparison with internal combustion engine driven vehicle, components, vehicle mechanics, vehicle kinetics, dynamics of vehicle motion, propulsion system design, drive cycle analysis, and energy demand**Unit-2Energy Storage Systems**Battery basics – types, parameters like capacity, discharge rate, state of charge, state of discharge, depth of discharge etc., technical characteristics, battery packs, properties of batteries, battery management, charging stations, charging protocols, ultracapacitors, fuel cells, flywheels, hydrogen as fuel**Unit-3Electric Machines for Vehicular Applications**Overview of conventional ac and dc motors, special electric machines such as permanent magnet machines, switched reluctance machines, linear motors, machine and engine rating, requirements, torque – speed characteristics and speed control, cooling of electric machines, testing of machines and testing standards**Unit-4Electric Vehicle Drive Train** Transmission efficiency, automotive components – gears, clutch, brakes, regenerative braking, acceleration and range, motor sizing, modelling, motion control, solar powered vehicle, power converters, inverters, auxiliary accessories, cooling systems, introduction to system engineering, selection of components and integration**Unit-5Hybrid Electric Vehicles** Types–series, parallel and series-parallel configurations, sizing of components, regulatory standards, grid integration, performance testing procedure for vehicle to grid, challenges associated with electrical vehicular technology**Unit-6Data Acquisition, Sensors and Control Systems**Overview of vehicular communication - within vehicle, with grid, digital communication systems, vehicle network theory, embedded control, actuators, data analysis and importance of data in maintainability, concept of driverless car

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Readings:

1. James Larminie, John Lowry, “Electric Vehicle Technology Explained”, John Wiley & Sons.
2. Iqbal Husain, “Electric and Hybrid Vehicles Design Fundamentals”, CRC Press, Taylor and Francis Group.
3. Sandeep Dharmeja, “Electric Vehicle Battery Systems”, Newnes.
4. K. T. Chau, Zheng Wang, “Chaos in Electrical Drive Systems: Analysis, Control & Applications”, John Wiley and Sons.
5. Chung Chow Chan, K. T. Chau, “Modern Electric Vehicle Technology”, Oxford University Press.
6. Michael H Westbrrok, “The Electric Car - Development and Future of Battery, Hybrid and Fuel Cell Cars” IEE Power and Energy Series 38, The Institution of Electrical Engineers.

EE701 Electrical Machine Design [3 0 2 4]

Course Learning Outcome:
After successful completion of this course, students will be able to

- apply theoretical concepts in designing conventional electrical machines
- select appropriate material for designing electrical machines
- estimate the machine performance based on the design outcome by data interpretation
- demonstrate the design by appropriate drawings

Syllabus:

General Aspects: Design considerations**, E**lectrical loading & magnetic loading, Output co-efficient, Factors affecting size of machines, Heating & cooling of electrical machines.
Design of DC Armature Windings: Simplex lap and simplex wave DC armature windings, Dummy coils and Equalizer connections.
Three Phase A.C. Windings: Single layer, Concentric, Hemitropic, Whole coil and mush winding, Double layer, Integral and fractional pitch winding, Factional slot winding.
Design of D.C. Machines: Introduction, Output equation, Choice of design parameters, Main dimensions of armature, Design of armature core, Design of armature winding, Length of air gap, Design of the field system, Design of commutator and brushes, Performance of commutator, Performance characteristics of designed machine.
Design of Three Phase Transformers: Introduction, Design equations, Choice of design parameters, Main dimensions of magnetic circuit, Mechanical forces in transformers, Tap changing, Transformer windings, Design of windings, Performance characteristics of designed transformer, Cooling system design.
Design of Three Phase Induction Motors: Introduction, Output equation, Choice of design parameters, Design of stator winding, Flux density in stator tooth, Depth of stator core, Length of air gap, Design of squirrel cage rotor, Design of wound rotor, Flux density in rotor tooth, Depth of rotor core, Performance relating to design, Performance characteristics of designed motor, Dispersion coefficient.
Design of Synchronous Machines: Output equation, Main dimensions, Choice of design parameters, Short circuit ratio and its consideration, Air gap length, Shape of pole face, Armature design, Armature winding, Slots, Length of mean turn and stator core, Calculation of armature resistance and reactance, Design of rotor, Design of pole and pole winding, Short circuit characteristic, Performance characteristics of designed machine.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Design Sheets / Computer Aided Drawings: Students are required to submit at least three design sheets (hand drawn or computer software) in full size as term work.
Sketch Book / Computer Aided Drawings: Sketches of components, windings and parts of designed machines are to be drawn in sketchbook / prepared using computer software.

References:

1. A. K. Sawhney, A Course in Electrical Machine Design, Dhanpat Rai and Sons.
2. V. N. Mittal, Design of Electrical Machines, Standard Publishers.
3. M. G. Say, Performance and design of A.C. machines, CBS Publishers.
4. A. E. Clayton, Performance and Design of D.C. Machines, CBS Publishers.
5. I. Dasgupta, Design of Transformers, Tata McGraw Hill.
6. BHEL - Transformers, Tata McGraw Hill.

EE714 Electromagnetic Interference and Compatibility [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

1. understand EMI/EMC problems in electrical systems
2. analyze the effects of EMI on system performance
3. select appropriate technique to reduce the EMI effects on electrical systems

Syllabus:
EMI and EMC Concepts: Terminology and definitions, Sources and victim of EMI, Conducted and radiated EMI emission and susceptibility, transient EMI, Electrostatic discharge (ESD).
EMI Coupling Principles: Conducted, Radiated and Transient coupling, Common ground impedance coupling, Common mode and ground loop coupling, Differential mode coupling, Field to cable coupling, Power mains and power supply coupling.
EMI in Analog and Digital Circuits: EMI issues in power circuits, Conducted noise emission from SMPS, Conducted noise emission standards, EMI issues in PWM techniques, Ground loops problem in power converters, Radiated emission issues in power converters, Power distribution issues in PCB using different converters, Power rail equivalent circuit, Frequency response of power rail.
EMI Control Techniques: Conducted noise emission calculation in frequency domain using graphical methods, Use of line filters, Design of line filters, Shielding, Filtering, Grounding, Transient suppressors, Filtering, Characteristics of filters, Impedance and lumped element filters, Power line filter design.
EMI / EMC Testing: International standards for EMI / EMC tests, Civilian standards- CISPR, FCC, IEC, EN, Military standards- MIL461E/462, British VDE standards, Euro norms, EN emission and susceptibility standards and specifications, Electrostatic discharge test, Fast transient and burst test, Conducted and Radiated radio frequency emission and immunity tests.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:
5.1Clayton R.Paul - Introduction to Electromagnetic Compatibility, John Wiley Publications.

5.2H. W. Ott - Noise reduction techniques in electronic systems, 2nd Edition, John Wiley & Sons.

5.3V. P. Kodali - Engineering EMC Principles, Measurements and Technologies, IEEE Press.

5.4E. L. Bronaugh and W. L. Lambdin - Electromagnetic interference test methodology and procedures, Interference Control Technologies Inc.

EC002 Embedded Systems [3 0 0 3]

Course Learning Outcomes:

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

1. understand the structure of an embedded systems, their characteristics, design requirements and applications
2. ability to identify the tools and techniques for embedded system hardware design
3. ability to identify tools and techniques for software of embedded system
4. understand operation of Real Time Operating System
5. understand Device Drivers and their role in Embedded System design

Syllabus:

Introduction: Embedded Systems overview, characteristics of embedded systems, applications, common design metrics, design challenges, Processor technology, IC technology, Design Technology, Types of Embedded systems, Hardware and software units of embedded systems, examples of embedded systems

Processors: General purpose processors, their basic architecture, operations, Superscalar and VLIW architectures, application specific system processors, digital signal processors, ARM processor, selecting a microprocessor

Embedded Programming: Embedded software development Tools and Languages

Real Time Operating Systems: Operating System introduction, Real Time Operating System (RTOS), RTOS functions, RTOS processor scheduling models, task prioritization, context switching, multitasking, inter task communication, event management, locking mechanism, interrupt handling, case study: RTx51 tiny RTOS

Device Drivers: Introduction, their functions, architecture, types, and implementations

Networks for Embedded Systems: Distributed embedded architecture, I2C, CAN, SPI, USB Bus

Embedded System Design: System design techniques, design methodologies, requirement analysis, specifications, system analysis and architecture design, Quality assurance, design example

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Raj Kamal, Embedded systems Architecture, Programming and Design, TMH
2. Wayne Wolf, Computers as components Principles of embedded computing system design, Morgan Kaufmann
3. Frank Vahid, Tony Givargis, Embedded system design: A unified Hardware/Software introduction, Wiley publishers
4. Shibu K V, Introduction to Embedded Systems, TMH

Nirma University
Institute of Technology
B Tech
2HS001, Entrepreneurship Development

[3 0 0 3]

Objective: To acquaint the engineering students with the basic concepts of Entrepreneurship with an effort to develop entrepreneurial skill amongst the students.

Entrepreneurship : Definition and structure. Entrepreneurial culture, the concept of Entrepreneurship. Entrepreneurial Traits: Entrepreneurial Skills, Qualities and Characteristics of an Entrepreneur, Nature and Importance of entrepreneurs. Entrepreneurship as a career choice. Contribution of entrepreneurs to the Development of the Nation.

Entrepreneurial Development : entrepreneurial Environment, Meaning and Process of entrepreneurial Development. Entrepreneurial Development Training, Importance, Objectives and Methods of Training.

Project Management : Search for Business Idea, Concept of Project and classification. Project Identification and Formulation. Project Design & Network Analysis. Project Report, Project Appraisal.

Financial Analysis : Investment Process, Break even analysis, Budget and Planning Process.

Sources of Finance : Sources of Development Finance, Financial Institutions.

Establishing a small scale Industry: Location, Steps of Setting up a Small Scale Industry, Selection of Organization.

Marketing Environment : Marketing Segmentation, Market Research, Market Planning.

Text/Reference Books:

1. A handbook for New entrepreneurs by EDI, Published by Oxford University Press.
2. Dynamics of Entrepreneurial Development and Management – Vasant Desai, Himalaya Publishing House
3. Entrepreneurship Development – Dr. Y.P. Hathi, Dr. Rupesh Vasani, Mahajan Publishing

B.Tech Semester VII (Electrical)

2EE402: INDUSTRIAL INSTRUMENTATION AND AUTOMATION [3 - 2 4]

Transducers: Main three blocks of instrumentation system – transducer / sensor, signal conditioner and display, definition, nature, principles, classification, static and dynamic performance characteristics of instrumentation system.

Displacement Measurement: capacitive, inductive and resistive type transducers and other methods for linear and angular displacement measurement, transducers and measurement systems for pressure, flow and level of liquid, solid & gaseous material.

Force, Weight & Torque Measurement Transducers: force, torque, weight strain, and pressure transducers, piezo-electric elements, piezo-electric transducers, piezo-electric accelerometers, Hall-effect devices and related compensation circuits.

Thermometry: resistance temperature detectors, thermocouples, thermistors and their circuits, use of linear expansion of solid, liquid and gas for measuring temperature and pressure, use of bimetallic strips (thermostat) for temperature measurement, hydrometry (density measurement).

Miscellaneous Transducers: Measurement of humidity and moisture, nuclear radiation detection and measurement, liquid level measurement, optical sensors, bio sensors, ultrasonic transducers, spectrophotometers, thermal conductivity meters, viscosity and specific gravity measurement.

Recorders: X - Y, strip chart and circular type graphic recorders, indicating, recording and controlling instruments, multi-channel recorders, signal conditioners i.e. buffer, comparator, instrumentation amplifier, wave shaper and filters, spectrum analyzer.

Automation: Introduction to automation system with block diagram, analog/digital, I/O Modules, elementary idea of LAN and SCADA, PLC and DCS used in automation system, scope of P.C. based automation system. Overall idea of automation used in some plants such as thermal power plant, cement plant, steel plant, production plant of any electrical equipments.

Laboratory Work:
This shall consist of at least 10 experiments based on the above syllabus.

Text Books:

1. C.S. Rangan, G.R. Sharma, V.S. Mani - Instrumentation: Devices and systems, TMH, 2nd Ed. 2006
2. E.O. Doeblin - Measurement systems : Application & Design, McGraw-Hill Professional, 2nd Ed. 1990

Reference Books:

1. Patranabis - Principles of Industrial Instrumentation, TMH, 3rd Ed. 2008
2. R. K. Jain - Mechanical and Industrial measurements, Khanna Publishers, 2008
3. Krishnakant - Computer based Industrial control, PHI 2nd Ed. 2008

NIRMA UNIVERSITY
Institute of Technology
B. Tech., All branches except CE/IT

L	T	P	C
2	0	2	3

Course Code	2CE003
Course Title	Internet and Web Technologies

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

- understand the architecture of web based applications and underlying technologies
- design an efficient web based applications using appropriate web technologies
- develop web based application using appropriate scripting languages

Syllabus:	Teaching Hours:
Unit I Internet Structure, Protocols and Access: Internet Protocol Model overview, Internet Addresses, Internet Protocol, Transport Layer, Upper layer Protocols, Internet Access, Internet Applications, About World Wide Web ,Future of Internet and Internet related applications WWW and Web Servers, IIS Configurations and settings, Apache Configuration, Introduction to PWS, Planning a Website. XHTML: Introduction, Forms, Internal Linking, Image Maps, meta, frameset	7
Unit II Cascaded Style Sheet: Inline styles, Embedded Style Sheets, Linking Style Sheets, Text Flow and Box Model. JavaScript: Introduction, Control Structures, Functions, Arrays, Objects.	8
Unit III Dynamic HTML: Object Model and Collection, Event Model, Filters and Transitions, Data binding and Tabular Data Control. XML: XML namespaces, DTDs and schemas, DOM , SAX, XSL, SOAP.	5
Unit IV ASP: Introduction, ASP Objects, FSO, Data Access Object. Building Interactive Animation: Working with Flash and Dream Weaver	6
Unit V Wireless Internet and m-business: Introduction to Wireless Internet, WAP, m-business. e- business and e-commerce. E- Business Models, Building an e-business Application, e-marketing, Security	4

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. Deitel Deitel Nieto, Internet and World Wide Web: How to Program, Pearson Education
2. Minoli, Internet and Intranet Engineering, McGraw Hill Education

L= Lecture, T= Tutorial, P= Practical, C= Credit

^This is not an exhaustive list

1 W.e.f. academic year 2017 – 2018 and onwards

Nirma University
Institute of Technology
B Tech
2HS003 Introduction of Accounts

[3 0 0 3]

Objective To understand the various concepts of financial and cost accounting

Financial Accounts : Accounting equation, Journal, Cash book, Ledger, Trial Balance, Profit & Loss Account, balance Sheet

Cost Accounts : Cost classification (direct cost, indirect cost, variable cost, fixed cost) Prime cost, conversion cost, full cost, Cost - Volume – Profit Analysis, Absorption costing, activity based costing, budgetary control, standard costing.

Reference Books:

Accounting for Managers by Jawaharlal TMH
Accounting Principles by Anthony &bn . Reece, AITB

Mech. Engg. Dept. Institute Elective Highlighted

ME001 Robotic Engineering [3 0 0 3]

Course Learning Outcome:

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

- apply the concept of robotics to select the type of manipulator best suitable to the application
- formulate the mathematical relations for kinematic analysis of robotic manipulator.
- integrate the structural design, actuator selections, drive system, sensor and control system necessary to implement a robot in a specific job task

Syllabus:
Robot technology:

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components

Robot motion analysis and control:

Robot arm kinematics, Forward & inverse kinematics solutions, Trajectory design.

Langrange-Euler formulation, Newton-Euler formulation, Generalized D'Alembert equation of motion, robot arm dynamics.

Actuators and sensors in Robot- AC/DC motors, stepper motors and servo motor, direct drive robot, Hydraulic and pneumatic systems.

Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors, External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

Robot programming & languages.

Types of End Effectors and Design
End effectors , Classification , Force analysis and Gripper design.

Introduction to Mobile robots, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the

questions will be asked from self study contents.

References:

1. Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall
2. Mittal and Nagrath , Robotics & Control , Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi
4. M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata McGraw Hill Education Pvt. Ltd
5. Ashitava Ghoshal, Robotics Fundamental Concepts & Analysis, Oxford University Press.

EE704 **Minor Project** **[0 0 4 2]**

Course Learning Outcome:

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

1 practice acquired knowledge within the chosen area of technology for project development

2 identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach

3 reproduce, improve and refine technical aspects for engineering projects

4 work as an individual or in a team in development of technical projects

5 report project related activities effectively to peers and mentors

Syllabus:

The student(s) shall carry out project based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit project report based on the work.

2EE4E8 ELECTIVE – II [3 - - 3]

2EE418: NON CONVENTIONAL ENERGY SOURCES [3 - - 3]

Energy Sources: Conventional, non-conventional, renewable and non-renewable sources, statistics of resources and data on different sources in world and in India, significance of renewable sources and their exploitation.

Energy Converters: Wind, hydro turbines, biomass energy converters and their characteristics, water pumps and their characteristics, different types of electric motors and generator - construction and characteristics.

Solar Energy: Solar radiation, terrestrial solar radiation, radiation balance, generalized transmission scattering by atmosphere, absorption of solar radiation, direct solar radiation. Low temperature solar radiation collector, flat plate collectors, low temperature applications of solar energy solar swimming systems, solar drying, basic drying parameters, design calculation of solar drier, solar heat pump, solar refrigeration and air conditioning, electricity by solar, solar panels for battery charging.

Solar Photovoltaic System: Characteristics, applications to lighting and water pumps, PV panels, characteristics of motors and pumps connected to PV set.

Solar Thermal System and its integration with Grid: Comparison with conventional thermal power plants, commonly used cycles for solar power plants, types of solar thermal power plants and their integration with grids.

Wind Energy System: Grid connected systems, system configuration, working principles, limitations, effects of wind speed on grid conditions, grid independent systems - wind-battery, wind-diesel, wind-hydro-biomass etc., wind operated pumps, controller for energy balance.

Small Hydro System: Grid connected system, system configuration, working principles, limitation, effect of hydro potential and grid condition, synchronous versus Induction Generator for standalone systems, use of electronic load controllers and self excited induction generators.

Wave Energy System: System configuration: grid connected and hybrid systems.

Energy situation: Non-conventional renewable energy sources, potential of renewable energy sources.

Biomass Energy System: System configuration, biomass engine driven generators feeding loads in stand alone or hybrid modes.

Energy Audit: Aim of energy audit, energy flow diagram, strategy, comparison with standards, energy management team, consideration in implementing energy conservation programmers, instruments for energy audit, energy audit of illumination system, electrical system, heating ventilation and air conditioning systems, compressed air system, buildings, steam generation, distribution and utilization system, economic analysis.

Textbooks:

1. G. D. Rai - Non Conventional Energy Sources, Khanna Publishers, 4th Ed. 2000.
2. Pradeep Chaturvedi Energy Management: Policy, Planning and Utilization, Concept Publishing Company, 1997.

Reference books:

1. D. Mukherjee and S. Chakrabarti - Fundamentals of Renewable Energy Systems new age publication 1st Ed. 2005
2. B.H.Khan - Non Conventional Energy Resources TMH 1st Ed. 2006

NIRMA UNIVERSITY
Institute of Technology

B. Tech., All branches except CE/IT

L	T	P	C
2	0	2	3

Course Code	**CE006**
Course Title	**Operating Systems**

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

understand the components and functionalities of a typical operating system
identify synchronization needs of various system resources for optimal utilization
experiment with various control and scheduling activities of operating system components

Syllabus:

Teaching Hours:

Unit I

Introduction: Evolution of operating systems, operating system services, types of operating system, different view of operating system, Review of types of I/O polled, interrupt driven and DMA. Process Scheduling: Concepts of Process, attributes of process, process control block, data structures. Processes and threads, process status, scheduler: long term, medium term, short term scheduler, matrix of evaluation, scheduling algorithms. — 7

Unit II

Inter process Communication(IPC):Need of IPC, concurrency, Race conditions, critical section, mutual exclusion problem, solution approaches, algorithmic approaches, critical region, condition for critical region, semaphore : Binary ,counting, the queuing implementation. Monitors, message passing: synchronous vs asynchronous message exchange. Classical IPC Problems: Dinning Philosopher Problem, Sleeping Barber Problem, Reader's & Writer Problem, procedure control. — 6

Unit III

Deadlock - Deadlock problem, deadlock characterization, dealing with dead lock, deadlock prevention, deadlock avoidance. Memory Management - Paging: Principle of operation, page allocation, h/w support for paging, multiprogramming with fixed no. of task, multiprogramming with variable no. of task, segmentation, virtual memory : concept of demand paging, page replacement algorithms, thrashing.	7

Unit IV

Input Output Management-Principles of input/output: Input / Output devices, device controllers, direct memory access, principles of input/output s/w : goals of the input/output s/w, concepts of interrupt handler and device driver, devices as files, the inode structure and organization.	5

Unit V

File Systems: file structure, file types, file access, file attributes, file operations, memory mapped files and directories: hierarchical directory system, pathnames, directory operations, contiguous allocation, linked list allocation, linked list using index, Inodes, Concepts of Shared files.	5

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

William Stalling, Operating System – Internals, Prantice Hall
Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall
Peterson, Operating System Concepts, Addition-Wesley Longman Publishing Co
Milan Milenkovic, Operating System – Design & Concepts, Mc Graw Hill
Stephen Prata, Advanced Unix - A Programmer's Guide, BPB Publications
Yashwant Kanitkar, Unix Shell Programming, BPB Publications
Sumitabha Das , Unix System V.4 Concepts & Applications, Pub. TMH
Maurice Bach, The Unix Operating System, Prentice Hall

L= Lecture, T= Tutorial, P= Practical, C= Credit
^This is not an exhaustive list

Nirma University

Institute of Technology
Mathematics & Humanities Department
SS 701, Organizational Behaviour

[2 0 0 2]

Course Learning Outcomes (CLO):

After studying the course the students will be able to:

7. Analyze and evaluate performance behavior at individual, group and organizational levels.
8. Develop the ability to lead and motivate others to succeed.
9. Develop critical analytical skills that will help them diagnose situations pertaining to human behavior and generate effective solutions for the same.
10. Understand and apply principles of organizational dynamics relating to systems, culture, structure and change processes

Syllabus

I. Introduction to Organizational Behaviour

- Concept of Organizational Behaviour (OB)
- History , Nature and scope of OB
- Key elements in OB
- Inter-disciplinary contribution to OB
- Managerial Roles

II. Individual Behaviour, Values & Personality

- Concept of Individual Differences
- Values commonly studied across culture
- Fundamentals and Determinants of Personality
- Big Five Dimensions
- Personality Traits

III. Learning & Perception

- Fundamentals of Learning
- Learning Theories - Classical Conditioning Theory, Operant Conditioning Theory, Social Learning Theory
- Behavior Modification
- Definition of Perception, Perceptual Process, Common Perceptual Errors

IV. Motivation

- Basic concept of Motivation

- Theories of Motivation – Maslow,Herzberg's Two Factor Theory, ERG, McClelland , Equity and Vroom's Expectancy Theory

V. Leadership

- Introduction
- Leadership Theories - Trait Theories, Behavioral Theories and Situational Theories

VI. Group Dynamics

- Defining and classifying groups
- Stages of group development
- Group Properties – Roles, Norms, Status, Size and Cohesiveness
- Group Decision making

VII. Managing Change in Organization

- Definition, Forces of Change,
- Causes for Resistance to Change, Overcoming Resistance to change
- Lewin's Change Model

VIII Organizational Culture

- Meaning, Strong Culture vs. Weak Culture
- Creating & sustaining Culture
- Socialization

IX. Conflict, Power & Politics

1. Nature & types of conflict, Causes and outcome of conflict
2. Responses to conflict
3. Bases of Individual Power
4. Organizational Politics

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

- Robbins, S.P.Judge, T.A. &, Sanghi, Seema. (2010). *Organizational Behavior*, Pearson.
- Pareek, U.(2011).*Understanding Organizational Behavior*, Oxford University Press.
- Luthans,F.(2006).*Organizational Behaviour*, Tata McGraw Hill.
- Sekaran,U. (1989).*Organizational Behaviour: Text and Cases*, Tata Mc Graw Hill
- Kreitner, R. &Kinicki, A.(2012). *Organizational Behavior*, McGrawHill/Irwin
- Davis,K. &Newstorm, J.W. (1989).*Organizational Behaviour*, Tata McGraw Hill
- Slocum,J.W&Hellreigal, D. (2010).*Fundamentals of Organizational Behaviour*, Cengage Learning.

EE703 Power System Protection and Switchgear [3 0 24]

Course Learning Outcome:
After successful completion of the course, student will be able to

- identify the main components and features of a protection scheme
- ault clearing phenomena under abnormal conditions in different type of circuit breakers
- to design the feasible protection systems needed for each main part of a power system
- apply conventional and numerical relays to the protection of rotating machines, busbars, transformers, transmission lines and distribution network

Syllabus:

Introduction and Philosophy of a Protective Relaying System:
Introduction, Abnormalities, Requirements of protective systems, Functions of protective relaying schemes, Basic relay terminology, Construction wise relay classification, Basic tripping circuit, Construction and features of different electromagnetic relays, Zones of protection, Main a Protection, Methods of discrimination.

Protective Current and Potential Transformer:
Current Transformer: Equivalent circuit, Vector diagram, Construction, Magnetization curve, Core material, Errors, Accuracy, Specifications.
Potential Transformer: Equivalent circuit, Construction, CVT, Specifications.

Overcurrent Protection: Construction, Principle, Classification, Overcurrent protective schemes, relay, Directional overcurrent protection, Application of overcurrent relays for feeder

Equipment Protection Schemes: Protection of Generator, Transformer, Motor and Busbar against various faults.

Distance Protection:
Impedance relay, Reactance relay, Mho relay, Input quantities for various types of distance rela of arc resistance, Effect of power swings, Effect of line length and source impedance on the performance of distance relays, Selection of distance relays, Three stepped impedance protection, of transmission line including principles of pilot wire and carrier protection.

Protection: Introduction, Numerical relay hardware, Numerical overcurrent protection, Numerical transformer differential protection, Numerical distance protection of transmission line, , Digital relaying algorithms.

r: Fault clearing and interruption of current, Theory of initiation of arc, Methods of quenching arc, Restriking and recovery voltage, Ratings of the circuit breaker, Construction and principle of indoor and outdoor types circuit breakers, Air break, Oil filled, Air blast, SF6, Vacuum and HVDC circuit breakers, Selection of circuit breakers, Elementary ideas of testing methods.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

SD

Laboratory Work:
This shall consist of at least 10 practical based on the above syllabus.

References:

- B. Ram and D. N. Vishwakarma, Power System Protection and Switchgear, Tata McGraw Hill.
- S. S. Rao, Switchgear and Protection, Khanna Publishers.
- B. Ravindranath and M. Chander, Power System Protection and Switchgear, New Age International.
- Y. G. Parithankar and S. R. Bhide, Fundamentals of Power System Protection, PHI.
- B.Bhalja, N.Chothani and R.P. Maheshwari, Protection and Switchgear, Oxford Publication.
- B. A. Oza, N. C. Nair, R. P. Mehta and V. H. Makwana, Power System Protection and Switchgear, Tata McGraw Hill.

2IC002 Programmable Logic Controller [3 0 0 3]

Course Learning Outcome:

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

understand the fundamental principles of Programmable logic controller, I/O modules
develop the ability to design program using standard programming technique
develop and design an application orientated project using PLC

Syllabus:

Introduction: Definition, advantages and Importance of PLC, Evolution history of PLC, Architecture and block diagram.

PLC hardware : Types of PLC, CPU unit architecture, Input/Output devices and interfacing, Hand held programming terminals, Industrial computer and monitors,

PLC operation: Ladder logic, Logic functions, Wiring diagaram

PLC Programming: Basic relay instructions, timer-counter instructions, comparison, data handling, input-output instructions, sequencer instruction

PLC applications and case studies.

Self Study:

The self study contents will be declared at the commencement of semester.Around 10% of the questions will be asked from self study

References:

1. Webb and Reis, Programmable Logic Controllers, Principles and Applications.
2. Mitra and Gupta, Programmable Logic Controllers and Industrial Automation an Introduction.

Nirma University
Institute of Technology
Department of Mathematics & Humanities
B Tech Sem - VII/VIII
2HS005, Technical Writing

[3 0 0 3]

Course Learning Outcome

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

- Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
- Understand how to apply technical information and knowledge in practical documents for a variety of a.) professional audiences (including peers and colleagues or management) and b) public audiences.
- Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.

An introduction to technical writing

- Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing.
- Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics.
- Audience recognition and involvement: High tech audience, low-tech. audience, gender neutral language.

Memorandum:

- Objectives, difference between memos, letters and emails. Criteria and format for writing and memos.

Technical description:

- Criteria and process.
- Technical instructions for user's manual

Report Writing:

- Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report.

Letter- writing:

- Business letters, Job-applications, Resume.

Business Proposals:

- Types & formats.

Graphic representation of Technical Data
SOP writing
Promotional Writings

- Technical Brochure designing
- Content writing for Websites (For promotional and troubleshooting purposes)
- Writing Fliers and Newsletters

Academic Writing

* Summaries, abstracts and instructions

Case studies on Technical Writing.

Reference Books:

- ✓ Sharon J. Gerson and Steven M. Gerson, , Technical writing – process and product ,Person Education Asia .
- ✓ Andrea J. Ratherford ,Basic Communication Skills for Technology,Person Education Asia
- ✓ Pfeiffer, W.S. and T.V.S. Padmaja. Technical Communication. Pearson
- ✓ Muralikrishna and Sunita Mishra. Communication Skills for Engineers. Pearson

EC003 Wireless Sensor Network [3 0 0 3]

Course Learning outcomes:

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

1. understand Wireless Sensor Networks concepts, principles and applications
2. understand communication protocols and standards utilized in Wireless Sensor Networks
3. analyze protocols used in various types of Wireless Sensor Networks
4. identify appropriate techniques, standards and tools for Wireless Sensor Network hardware design

Syllabus:

Introduction of Wireless Sensor Networks: Introduction to adhoc networks, Sensor Network Technology-Hardware and Software, Applications of Sensor Networks, sensor network architectural elements, challenges in sensor network design

Wireless Transmission Technology and Systems: Bluetooth; IEEE 802.11; ZigBee; Radio-frequency identification (RFID)

Medium Access Control Protocols for Wireless Sensor Networks: Fundamentals of MAC Protocols, Performance Requirements, Types of MAC protocols - Schedule-Based and Random Access-Based Protocols,

Routing Protocols for Wireless Sensor Networks: Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks - Flooding and Its Variants, LEACH, Power-Efficient Gathering in Sensor Information Systems, Directed diffusion, Geographical routing

Transport Control Protocols for Wireless Sensor Networks: Traditional Transport Control Protocols-TCP, UDP; Feasibility of Using TCP or UDP for wireless sensor networks, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols- CODA (Congestion Detection and Avoidance), ESRT (Event-to-Sink Reliable Transport)

Middleware for Wireless Sensor Networks: Wireless Sensor Networks Middleware Principles, Middleware Architecture, Existing Middleware-MiLAN (Middleware Linking Applications and Networks)

Network Management for Wireless Sensor Networks: Network Management Requirements, Network Management Design Issues, Example of Management Architecture: MANNA, Naming, Localization Issues

Operating Systems for Wireless Sensor Networks: Operating System Design Issues, TinyOS – case study

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless Sensor Networks, Technology, protocols, and applications, Wiley
- Edgar H. Callaway, Wireless Sensor Networks: Architectures and Protocols, CRC Press
- Anna Hac, Wireless Sensor Network Design, Wiley
- Holger Karl, Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, Wiley.

EE801 Major Project [0 0 30 21]

Course Learning Outcome:

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

1. use various tools and techniques to study existing systems
2. critically analyse existing systems, thereby select and justify parameters to be improved
3. start and manipulate proposed engineering solution as per industry / research / societal need
4. achieve precision in uses of the tools related to their experiments/fabrication
5. reorganize and refine various components of technology to optimize the resources at large
6. appraise the potential of technology for scalability and wide spectrum of applications
7. report project related activities effectively to peers, mentors and society
8. follow and value health, safety and ethical practices during project

Syllabus:

The major project shall be based on the recent trends in technology, system/process analysis, construction/fabrication/production techniques, design methodologies etc. The student(s) shall carry out a comprehensive project at relevant Academic/R&D/Industrial organisation based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit comprehensive project report based on the work.

NIRMA UNIVERSITY
INSTITUTE OF PHARMACY
UNIVERSITY ELECTIVE
COURSE NAME: COSMETIC TECHNOLOGY
Course Code : UEIP001

Learning Outcomes:
After successful completion of the course student will be able to :

- Acquire comprehensive knowledge about the various raw materials used in cosmetic formulations
- Create and develop cosmetic formulations
- Analyze the cosmetic formulations for evaluating its efficacy and safety
- Understand the regulatory guidelines related to cosmetic formulations

Theory (Detailed Syllabus)

L P C 3 - 3

1. Introduction: The scope, historical background and present status of herbal cosmetics.
2. Classification of Cosmetics.
3. Raw materials used for formulation of skin care and hair care cosmetics: Source and description of raw materials of natural origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations.
4. Formulation and analysis of cosmetics: hair care, skin care and oral care products.
5. In vitro and in vivo models for efficacy testing for various cosmetic products.

6. Regulatory guidelines:

   Complaince of Drug & Cosmetic Act 1940 with reference to provisions for packaging and labelling (Rule 150 A, schedule S), permitted colors, flavors etc.

   BIS guidelines for cosmetic products and raw materials.

Total Lectures: 45

Books Recommended:

1. Sagarin Edward, Cosmetic Science and Technology Vol. I, II, III , Wiley India Pvt. Ltd., Canada, 1992

2. Sharma P.P., Cosmetic Formulation, Management and Quality Control, Vandana Publications Pvt. Ltd., Vandana Publications, Delhi, 2010

3. Paye M, Barel A.O., Maibach H.I., Handbook of Cosmetic Sciences, Informa Press, Tylor and Fransis, LLC, 2006

4. Panda H., Herbal Cosmetics Handbook, Asia pacific Business press, 2004

5. Veermeer B.J., Cosmeceuticals: Drugs vs. Cosmetics, Marcel Dekker, Editors: Peter Elsener, Howard I. Maibach, Marcel Dekker Inc., New York, 2000.

COURSE NAME: DRUG LAWS

Course Code : UEIP002

L	P	C
3	-	3

Learning Outcomes:

After successful completion of the course, the student will able to

1. Understand the significance and relevance of Pharmaceutical laws in India related to manufacturing, sale, import and export of drugs and cosmetics.
2. Apply knowledge of laws in manufacturing of narcotic drugs, psychotropic substance, alcoholic preparations, etc.
3. Analyze invention and process for determining its suitability for patent filing.
4. Evaluate and estimate drug pricing procedure in India.

Theory (Detailed Syllabus)

1. Introduction to Drugs & Pharmaceutical Industry
   Classification of Drugs and Cosmetics, types of Pharmaceutical Industries. Importance of Legislations in Pharmaceutical sector
2. Drugs and Cosmetics Act 1940, and its Rules 1945
   Act and rules related to manufacturing, labeling, packing, sale, import and export of drugs and cosmetic products.
3. Narcotic Drugs and Psychotropic Substances Act, 1985 and Rules
   Act and rules for controlling the production of opium, manufacturing, sale, import and export of narcotic drugs and psychotropic substances. Powers to make search, seizer and arrest.
4. Medicinal and Toilet Preparations (Excise Duties) Act, 1955 and Rules
   Act and rules related to licensing, manufacturing, sale, warehousing & export of alcoholic preparations at bonded and non-bonded laboratories.
5. Patent (Amended) Act 2005
   Introduction to intellectual property rights (IPR), types of patents, procedures for grant of patent, term and revocation of patent, patent agent.
6. Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 & Rules
7. An overview of Pharmaceutical Policy Act 2002, Drug (Price Control) Order 1995 and National Pharmacy Pricing Authority (NPPA) of India

Note: The teaching of all the above acts should cover the latest amendments, administrative duties and powers, offences and penalties, case studies.

Total Lectures: **45**

Books Recommended :

1. Official Acts published in Gazettes of India by Govt. of India.
2. Malik Vijay, Law relating to Drugs and Cosmetic, 19th edition, 2008, Eastern Book Company, Lucknow
3. Jain N.K., Pharmaceutical Jurisprudence, 6th edition, 2005, Vallabh Prakashan, Delhi
4. Mithal B.M., A Textbook of Forensic Pharmacy, 10th edition, 2002, Vallabh Prakashan, Delhi
5. Kokate C.K., Gokhale S.B., Textbook of Forensic Pharmacy, 1st edition, 2006, Pharma Book Syndicate, Hyderabad
6. Suresh B., Forensic Pharmacy: Pharmaceutical Jurisprudence, 11th edition, 2007, Birla Publications India, Delhi
7. Gandhi N., Popli H., Pharmaceutical Jurisprudence, 1st edition, 2006, C. B. S. Publishers & Distributors, Delhi

NIRMA UNIVERSITY
INSTITUTE OF LAW

University Elective Course
Academic year 2015-16
Course Code : UEIL022
Energy and Law

Teaching Hours: 45 Credit: 3

I Introduction

Energy has become one of the most essential needs of our lives. It is critical in the process of evolution, growth and survival of human beings and also in the socioeconomic development of a nation. The economy of the nation is dependent on abundant and uninterrupted supply of energy in all sectors, particularly electricity. It has become as a 'strategic commodity'. Most of the countries do not meet its current energy requirements and it is believed that the energy demand will manifestly increase in the future. It is expected that the worldwide energy demand will be doubled by 2050. Thus it becomes a great concern for most of the countries how they will satisfy their huge rising energy demand. This energy demand should also be met in an environmentally friendly way. Meeting energy demands is not only aimed at achieving economic growth but is also aimed at alleviation of poverty, unemployment and to meet other goals. Every country, therefore, undertakes a strategic plan to meet its energy demands, and to address the energy poverty and also the environmental effects of energy growth. With wide variety of sources available to chose from, the outcome is really complex as the problems that come to the fore-front makes the analysis of the subject even more interesting to ponder upon the challenges that this basic need of life throws upon us.

II Course Learning Outcomes

After the completion of the course the students will be able to:

1. Identify the challenges that legal regulations face in specific sectors in terms of consumption, production and conservation of energy
2. Classify the role and responsibility of the various stakeholders to conserve and preserve energy using tools of audit and management
3. Analyze the impact of the consumption of energy by the stakeholders in context of societal norms

III SYLLABUS

0. Energy from Non- renewable sources (Coal, oil and natural gas)

A. The goal that India seeks to achieve is to secure availability of coal to meet the demand of various sectors of the economy in an eco-friendly, sustainable and cost effective manner. This unit seeks to study as to why coal is such an important sector under energy law regime and how is the production of this non-renewable source of energy regulated? What do we understand by the concept of power generation? What are the main components of a thermal power plant and what sort of an effect does this energy production and use have on the climate?

How are coal blocks allocated? Discussion as to their allocation procedures and existing discrepancies with lessons to be learnt from the past scams will be explored in the light of the Coal Mines (Nationalisation) Act, 1973 and the most recent Coal Mines (Special Provisions) Bill, 2014. The coal mining industry is not free from hazards and it has been claimed by the ministry that the coal mine safety legislation in India is one of the most comprehensive and pervasive statutory framework for ensuring occupational health and safety. Directorate-General of Mines Safety (DGMS) under the Union Ministry of Labour & Employment (MOL&E) is entrusted to administer these statutes. It is through this unit, it will be studied that whether or not the statutes framed under the Mines Act, 1952; Mine Rules, 1955, and Coal Mine Regulation, 1957 have effective provisions as to mines safety and occupational health?

B. The Petroleum and Natural Gas Regulatory Board Act, 2006 establishes the Petroleum and Natural Gas Regulatory Board to regulate the various activities in the production chain of petroleum products and natural gas. This Unit studies the need for Oil and Natural gas as a source of non-renewable energy and the alternatives that are available to this energy source. How the energy resource is generated and made available for consumers? Whether or not the laws relating to this energy source are adequate to address the issues relating to the pricing of oil and regulation of prices in the domestic market in accordance to the prices fluctuation in the international market? How does the Government of India make provisions for subsidies in this sector?

References:

1. J.P. Longwell, E.S. Rubin, J. Wilson, *Coal: Energy for the future,* 21 Progress in Energy and Combustion Science 4, 269–360 (1995)
2. Mark Z. Jacobson and Gilbert M. Masters, *Exploiting Wind Versus Coal,* 293Science 5534, 1438 (2001)
3. P.V. Zedtwitza and A. Steinfelda, *The solar thermal gasification of coal; energy conversion*

efficiency and CO2 mitigation potential, 28 Energy, 441–456 (2003) 4. Thomas Thielemanna, Sandro Schmidta, J. Peter Gerlinga*, Lignite and hard coal: Energy suppliers for world needs until the year 2100: An outlook,* 72 International Journal of Coal Geology 1, 1–14 (2007)

STATUTES

1. The Coal Mines (Nationalization) Act, 1973
2. Notification dated 22/6/2010 from website of Central Board of Excise and Customs regarding levy of Clean Energy Cess on raw coal, lignite and peat w.e.f. 1.7.2010 3. The Coal Mines (Special Provisions) Bill, 2014
4. Coal Mines (Conservation & Development) Amendment Rules, 2011 and CM(C&D) Second Amendment Rules, 2011
5. Colliery Control Rules, 2004
6. Oil Industry Act, 1974
7. Petroleum Rules, 1976
8. The Oil Fields Act, 1948
9. The Petroleum Act, 1934
10. Safety in Offshore Operations Rules, 2008

1. Nuclear energy

Nuclear energy is being seen as the new-age source of energy. But the issue that exists here is regarding the determination of the fact that whether the potential danger of nuclear power plant is ignored by India to find a shortcut to meet its energy demand when it does not have effective laws to regulate the atomic energy sector?

How did the nuclear energy come to be used for civil purposes? What are the international atomic energy agencies? Do they effectively regulate the civil uses of nuclear energy? How has the past disasters and accidents been instrumental in framing stricter safety norms both in the international and domestic levels? What are the causes and effect of Indo-US nuclear deal? What are the factors that led to the enactment of Civil Liability for Nuclear Damage Act? Is this Act exhaustive, effective and constitutionally valid? How effective is atomic energy laws in India? Whether foreign direct investment should be encouraged in the atomic energy sector? What is the concept of power generation and thermo-nuclear fusion versus fission reaction in terms of nuclear energy?

References:

1. Saurabh Bhattacharjee, *Looking through the prism of international environment and human rights law- International Civil Nuclear Liability Law and a call for Indian exceptionalism,* 3

Int.J. Nuclear Law 4 (2012)
2. K. Konoorayar, Vishnu and V.S. Jaya, *Atomic Energy Law in India: An Analysis*, 1 KLRI Journal of Law and Legislation, Seoul, (2011)
3. Elli Louka, *Nuclear Weapons:Justice and the Law*, Edward Elgar Publishing Limited, Massachusetts, U.S.A (2011)
4. Prashant Hosur, *Indo-US Civilian Nuclear Agreement*, *65 Int'l J. 437, (2009-2010)*

STATUTES

1. Atomic Energy Act, 1962
2. Civil Liability for Nuclear Damage Act, 2010
3. Atomic Energy (Factories) Rules, 1996.
4. Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987
5. IAEA Handbook on Nuclear Law (2003)
6. *IAEA Nuclear Safety Review for the year 2013, Doc GC(57)/INF/3 (July 2013)*

2. Hydropower

Hydropower is considered to be a very viable source of energy. However, due to uncertain monsoons in a country like India, there is a growing concern as to the reliability on hydropower as a source of energy. It has been seen that most of the potential is in Himalayan States as river based projects and in other States on irrigation canals. The small hydropower programme is now essentially private investment driven. Projects are normally economically viable and private sector is showing lot of interest in investing in it. Through this unit a number of aspects in relation to hydropower would be analysed.

How can hydropower plants be classified and what are their functions? What are the main components of hydropower plants? What is the concept of power generation with respect to hydropower plants? How do hydro turbines function and what are its governing principles? Do the laws relating to hydro power generation effectively deal with the issues relating to rural electrification? What is the solution to soil conservation and environment management which are impacted as a consequence of such hydropower generation? What are the infrastructural challenges to building hydropower projects?

References:

1. D. S. Subrahmanyam*, Status of Electric power generation in India with special emphasis on Hydropower expansion,* 01 INTERNATIONAL JOURNAL OF RENEWABLE ENERGY AND ENVIRONMENTAL ENGINEERING 01, ISSN 2348-0157, October 2013, IJREEE 010107 (2013)
2. S.C. Bhattacharya and Chinmoy Janaa, *Renewable energy in India: Historical developments and prospects,* 34 ENERGY 8, 981–991(2009)
3. Himanshu Nautiyal, S.K. Singal, Varuna, Aashish Sharma, *Small hydropower for sustainable*

energy development in India, 15 RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 4, 2021–2027 (May 2011)

STATUTES

1. Electricity Act, 2003

3. Solar energy What is meant by Radiation geometry? What are the various solar thermal applications, in the light of flat plate collector, air heaters, power generation etc.? What are the theories and applications surrounding solar photo-voltaic power generation: theory and applications? What are the legal challenges in the tariff structure? Is solar energy 'actually' clean?

References*:*

- "E-book: Ministry of power, coal and new renewal energy" (January 22, 2015)http://mnre.gov.in/file
- manager/UserFiles/ministry%20of%20power,%20coal%20and%20new%20renewal%20energy%20ebook%20english%20virsion/index.html#page/14.
- World Bank Report (2010) "Unleashing the potential of Renewable Energy in India" • "Implementing National Solar Mission in India Need for an effective Legal and Institutional Response: Policy and Legal Recommendations" available from *www.boell india.org*last visited on 24th January, 2015
- Donald Zillman and Raymond Deeny, *Legal Aspects of Solar Energy Development*, Ariz. St. L.J. 25, (1976)
- Steven E. Ferrey, *Solar Banking: Constructing New Solutions to the Urban Energy Crisis*, 18 HARV. J. ON LEGIS. 483 (1981)

4. Wind energy Tapping into the huge potential of wind by setting up infrastructure can be considered to make it one of the most favourable source of energy. Though present in abundance but in order to get the right amount of energy from this source requires one to first answer some pertinent issues. What is/are the source(s) of wind formation? What are the Site selection parameters to harness this form of energy? In case of innovation how does one seek protection for the '*novelty*'? How to overcome issues in financing and set cost-efficient standards? What is the regulatory compliance with respect to Renewable Purchase Obligations?

References:

• Salvus Capital Advisors Pvt. Ltd and Sustainable Development Department, New Delhi Investment in Indian Wind Energy Sector: A research report(January 25, 2015) available at *www.salvuscapital.com/iiwes.pdf*.

• Global Wind Energy Council India Wind Energy Outlook 2012(January 25, 2015) *www.wisein.org*

• P R Krithika and Siddha Mahajan Background paper *Governance of renewable energy in India: Issues and challenges* TERI-NFA Working Paper Series No.14, (2014) • Ernest Smith, *Wind Energy: Siting Controversies and Rights in Wind* 1 ENVTL. & ENERGY L. & POL'Y J. 281 (2005-2007)

5. Energy from biomass and biogas Considered to be as one of the cleanest forms of fuels this source of energy is converted into the using different processes of biomass conversion. In the process *gasifiers* are used and plants have to set up for the same. This source of energy though is widely accepted but has suffered from the typical mindset that people have and also the stiff competition that it faces from the other sources. What are the tariff issues and role of Renewable Energy Certificates? Do these create conflicts? How can Open Access prevent the Legal Wrangle in the power generation under the Electricity Act, 2003? Does the use of this fuel have a positive impact upon climate change?

References:

• P.R. Shukla, *Biomass Energy in India: Policies and Prospects*(January 24, 2015) www.decisioncraft.com/energy/papers/ecc/re/biomass/bpi.pdf

• John Cobb, *Mitigating the Unintended Consequences of Biofuel Tax Credits*, 49 HARV. J. ON LEGIS. 451 (2012)

• Sarah M. Hayter, *Climate Change Mitigation with Renewable Biomass: Shifting Legal Incentives away from Electricity and Towards Cogeneration*, 31 Miss. C. L. Rev. 429 (2012-2013)

6. Geothermal energy What are Geothermal resources? How can power be generated from the use of geothermal energy? How are tariffs and incentives regulated in this sector?

References:

· India Geo-thermal Energy (January 23, 2015) available at http://www.eai.in/ref/ae/geo/geo.html last visited on

· Ingvar B. Fridleifsson, *Status of Geothermal Energy amongst the World's Energy Sources* (January 24, 2015), https://pangea.stanford.edu/ERE/pdf/IGAstandard/EGC/szeged/O-7- 03.pdf

· Peter Bayer *et al,International legal status of the use of shallow geothermal energy,* RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 14 2611–2625 (2010) · John Brooks, *Legal Problems of the Geothermal Industry*, 6 NAT. RESOURCES J. 511 (1966)

· L. Rybach, *Geothermal energy: sustainability and the environment*, 32, GEOTHERMICS, pp. 463–

470, (2003).

· Sukanta Roy and Harsh Gupta, *Geothermal Energy: An Overview*, (23January, 2015) www.environmentportal.in/files/file/geo%20energy.pdf

7. Preserving Energy: Energy Audit and Management Though this whole idea seems to be a bit astonishing as to why should we conserve energy when there are so many sources available but the reason for the conservation is two-fold: save one's own cost and save unwanted depletion of sources. The Ministry of Power through its agency Bureau of Energy Efficiency has taken up the task to sensitize the need of conservation of energy and highlighted the various standards and procedure that is required to be followed in conserving energy through its models of audit and reporting. Integrated Resource Planning is one of the said methods which suggests such a step in this direction. But can the success found in US in adopting this model, be repeated here? Also given the various models of auditing and with the lack of compulsion or incentives, does the role of the authorities become less predominant and rather passive? What is the role of corporations and industries in conserving energy? Is climate change an inevitable process?

References:

• Ruth Hillary, *Environmental Auditing: Concepts, Methods and Developments*, 2, Issue 1, INTERNATIONAL JOURNAL OF AUDITING, 71–85, (1998).

• Angelina Liang, *Shedding Light: The Role of Public Utility Commissions in Encouraging Adoption of Energy Efficient Lighting by Low-Income Households*, 38 COLUM. J. ENVTL. L. 333 (2013)

• Odile J. Lim Tung, *Appraisal of the Energy Efficiency Regulatory Framework in Mauritius*, 31 J. ENERGY & NAT. RESOURCES L. 425 (2013)

• Amanda R Carrico, *Energy and Climate Change: Key Lessons for Implementing the Behavioral Wedge*, 2 GEO. WASH. J. ENERGY & ENVTL. L. 61 (2011) • Edward A. Finklea and Mary P. Treiber, *Residential Energy Conservation Measures: A Penny Saved Is a Penny Earned*, 11 ENVTL. L. 639 (1980-1981)

V Additional References

1. P. C. SHARMA POWER PLANT ENGINEERING, (7th ed.) (2002).
2. V.L. PATEL AND R.N. PATEL., FLUID POWER ENGINEERING, (3rd ed.) (2007).
3. D.S. KUMAR, FLUID MECHANICS AND FLUID POWER ENGINEERING, (6th ed.) (1998).
4. S P SUKHATME AND J K NAYAK, SOLAR ENERGY, (3rd ed.) (2008).

5. PARAG DIWAN AND A.C. KHERENERGY LAW AND POLICY, (2008 ed.)
6. CHHATRAPATI SINGH *ET AL,* TOWARDS ENERGY CONSERVATION LAW, (1989 ed.)
7. ASIAN DEVELOPMENT BANK, ENERGY INFRASTRUCTURE: PRIORITIES, CONSTRAINTS AND STRATEGIES FOR INDIA, (2009 ed.)
8. Ministry of New and Renewable Energy Government of India and UNDP (India) Bioenergy in India
9. *Position Paper on Open Access* (January 24, 2015), http://indianpowersector.com/home/downloads-2/downloads/

10. *Evolving measures for the effective implementation of Prepaid Metering in the country*, (January 24, 2015) http://indianpowersector.com/home/downloads-2/downloads/ 11. Prem K. Kalra and Rajiv Shekhar *Urban Energy Management* pp. 190-207 available at www.iitk.ac.in/3inetwork/html/reports/IIR2006/Urban_Energy.pdf (last visited on 23rd January, 2015).
12. *IPPs in Renewable Energy – Opportunities and Pitfalls* (January 23, 2015) http://www.eai.in/ref/wp/ipps-in-renewable-energy-opportunities-pitfalls 13. Stephen L Joseph, *Legal Issues Confronting the Exploitation of Renewable Sources of Energy from the Oceans*, 11 CAL. W. INT'L L.J. 387 (1981)
14. Edward H Comer, *Future of Energy Law – Electricity*, 31 UTAH ENVTL. L. REV. 429 (2011)
15. Babette Marzheuser-Wood, *UK - The Carbon Reduction Commitment and Its Impact on Global Franchisors*, 8 INT'L J. FRANCHISING L. 29 (2010)
16. Uma Outka, *Renewable Energy Footprint*, 30 STAN. ENVTL. L. J. 241 (2011)

Course Title: Financial Management
Course Code: UEIM007
Credit Hours: 3

Programme: University Elective

Syllabus

MODULE 1: BASICS OF FINANCIAL MANAGEMENT
Introduction to Financial Management, Role and Functions of the Finance function, Time Value of Money, Basics of Risk and Return

MODULE 2: FINANCIAL MARKETS AND INSTRUMENTS
The Financial System, Introduction to Financial Markets and Instruments, Sources and Cost of Capital

MODULE 3: MAJOR FINANCIAL DECISIONS
The Investment Decision, The Funding Decision, The Distribution of Profit Decision, Introduction to Working Capital Management, Managing Risk

MODULE 4: USING SPREADSHEETS IN FINANCE
Introduction to Financial functions in Spreadsheets, Spreadsheet Application Exercises

COURSE NAME: HEALTH AND NUTRITION

Course Code: UEIP013

After successful completion of the course student will be able to:

1. Remember the fundamentals of health and nutrition
2. Cite examples of food labelling
3. Describe significance of macronutrients and micronutrients
4. Discuss importance of functional foods
5. Explain indicators of nutritional status

L P C 3 -- 3

1. Introduction to the basic concepts of health and nutrition

2. Nutrition

- Macronutrients: Carbohydrates (including dietary fibers), fats and proteins
- Micronutrients: Vitamins, minerals, anti-oxidants, gut flora
- Significance of macronutrients and micronutrients for optimal health

3. Meal Planning

- Functional foods: Definition of functional foods, Role of functional ingredients and food in nutrition, Health attributes of functional foods
- Health attributes of nutrition: Diet and disease, Diet with respect to special population (elderly, pediatric and pregnant women),
- Indicators for maintenance of nutritional status: Nutrition Balance Indicator, Satiety Index, Fullness factor, Glycemic index and insulin index

4. Food Labelling (Food service management)

- Nutrition Facts Panel
- Serving Size
- Calories
- Ingredients list
- Quantitative indications

- Food additives
- The percent daily value
- Allergan labelling

Total Lectures **45**

Books Recommended

1. Nutritional Sciences: From fundamental to food. By Michelle McGuireand Kathy Beerman. Publisher: Yolanda Cassio. ISBN-13: 978-0840058201

2. Pressman, Alan H., Sheila Buff, and Gary Null. The Complete Idiot's Guide to Vitamins and Minerals. New York: Alpha Books.

3. Focus on Pathophysiology, Barbara A. Bullock and Reet L. Henze Lippincott Williams & Wilkins, Philadelphia
4. Lehninger Principles of Biochemistry, 3rd ed London : Macmillan Press Ltd.

5. Tortora G.J. and Anagnodokos, N.P. Principles of Anatomy and Physiology (Harper and Colling Publishers, New York)

6. Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism By: Carolyn D. Berdanier, Lynnette A. Berdanier, Janos Zempleni. Publisher: CRC Press. ISBN 9781420055528
7. Functional Foods and Nutraceuticals By: Aluko, Rotimi E. Publisher: Springer

8. B. Srilakshmi. Food science. India, New Age International (P) Limited.

9. Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth, Ranjana Mahna & Seema Puri . Textbook of Nutrition and Dietetics. India, Elite Publishers.
10. C.Gopalan. Nutritive Value of Indian Foods, India, ICMR publications.

Course Title: Human Resource Management

Course Code: UEIM006
Credit Hours: 3
Programme: University Elective

Course Overview

Organisations exist to fulfill their purpose and achieve their respective business goals. This underlying theme guides all action within organisations and also becomes the integrating force that binds the various roles within organisations. In a dynamic environment, as the business realities continue to evolve, newer contexts emerge leading to a continuously evolving disciplinary emphasis.

Human Resource Management (HRM) deals with the design, development and implementation of strategies, systems and processes that help an Organization effectively deploy its human resources for achieving organizational purpose. Recruitment, training, performance management, reward and recognition and managing employee relationships are the many facets of this dimension of managing an enterprise.

This introductory course in human resource management will provide a conceptual overview and theoretical framework of HRM as a management discipline. The purpose is to acquaint the participants with its role in achieving Organization objectives and the role of Non-HR specialists in making HRM effective in organizations.

Course Learning Outcomes

By the end of the course, the students would be able to:

1. Describe roles and responsibilities of the HRM function
2. Identify different systems within HRM viz. Recruitment and Selection, Performance Management, Compensation Management, Employee Relationship Management and recognize their strategic contribution to business and organizations;
3. Distinguish between people management role of HR and non-HR specialist in organizations

Syllabus

An Introduction to Human Resource Management; HRD and HRM; Corporate Strategy and Human Resource Management; Human Resource Planning; Job Analysis, Recruitment & Selection; Performance Management; Compensation Management; Learning & Development; Employee Relationship Management; Industrial Disputes & Conflicts; Labour Legislation; HRM in Cross-cultural and Global Environments; Organisation Learning; Ethics and Ethical Issues in HRM; Skills and Competencies of a Human Resource Manager; Human Resource Management in Family owned businesses and Not for profit organizations; Organisational Transformation and HRM; Contemporary

Suggested Readings:

- Pande, Sharon and Basak, Swapnalekha (2016), *Human Resource Management*, 2nd Ed., Pearson Education: New Delhi
- Dessler, Gary. Varkkey, Biju (2015), *Human Resource Management*, 13th Ed., Pearson Education: New Delhi
- Bohlander, George. Snell, Scott. & Vohra, Veena (2014), *Human Resources Management*, Cengage Learning: New Delhi
- Bernardin, John, H.(2007), *Human Resource Management – An Experiential Approach*, Tata McGraw Hill Publishing Company Limited: New Delhi
- Singh B.D.(2004), *Industrial Relations*, *Emerging Paradigms,* Excel Books: New Delhi

NIRMA UNIVERSITY
INSTITUTE OF LAW

University Elective Course
Academic year 2015-16

Information Technology and Cyber Law

Teaching Hours: 45 Credit: 3 **I Introduction**

The rapid growth of computer technology makes our life easier and attracts us to make every transaction by using electronic sources. All of us use computer every day through personal computer, laptop, mobile phone, notebook, *etc.* On the other hand unemployed persons are attracted to involve in unethical and unsocial activities, even in some of the cases, it extend to criminal activities. This course will disseminate the knowledge of computer technology which use cyberspace to transact the text, photo, documents, videos, money, etc. The course will also develop their ability to link internet technology with legal principles in fixing the tortious liabilities of the wrongdoer to compensate the victim and criminal liabilities of the offenders after following the due process of law. The Course will create ability among the students to apply Indian Information Technology Act in regulating E-Commerce, E-Governance, E-Banking and cybercrimes.

II Course Learning Outcome:

After the completion of the course the students will be able to:

1. Understand the information technology with technical & social perspectives. 2. Analyses the critical issues in developing cyber jurisprudence & policy.

III Syllabus

Module 1: Information Technology

What is Networking and Internet? What are various Computer Technologies used in Networking? What is relation between Computer Web Technology? , Types of networks; Intra-net and internet, Understanding Internet, www, Computer Memory and Storage, What is relationship between Cyberspace, Technology and Law, Defining the Scope of Information Communication Technology

Module 2: Stakeholders in cyber world

Defining the expansion of Cyber World & IT Industry, Who are Users (subscribers), Service Providers, Intermediaries, Cyber Cafe and other stakeholders. What kind of Agreements are Regulating Stakeholders Relationships: Click Wrap, Shrink Wrap, EDI. Discussing Electronic Contracts regulations in Indian & Cross Border Contracts (Reference to IT Act 2000 & UNCITRAL Model Law)

Module 3: Issues related to Software and Web designing

What are various IPR Issues in Cyber Space?, What is Domain Name Dispute, Cyber Squatting, What is Meta-Tagging, Framing and linking issue, Understanding Issues related to copyright, trade name and trademark infringement in IPR Law, Issues relating to Biotechnology and ICT related to software copyright, software privacy, open source software.

Module 4: Regulating Information Technology

How Authentication of electronic Records is done?, what digital signature? & how it is different from electronic signature?, what are regulatory powers of Controller and Certifying authorities?, Understanding, E-governance, E-commerce, E-banking including mobile banking, What are Civil liabilities under IT Act, Who is Adjudicating officer & What is Cyber Regulation Appellate Tribunal.

Module 5: Cyber Crimes

What is Cyber Crimes & what are its various classifications?, Appraisal of Crimes targeting Commuters, Social crimes committed through internet, Cyber pornography and stalking, Personal crimes, Economic offenses and Social Networking, Terrorist activities through internet. What are various measures taken by government to prevent cybercrimes?

Module 6: Investigation of cyber crimes

How investigation of cybercrime is done? Who is responsible for Cyber Crime Investigation? What are Territorial powers and issues, Confiscation of the computer and other e-devices? What is Computer and cyber forensics, discussing the Admissibility of E-Evidence in court of Law?

Module 7: Issues and challenges to cyber law

Discussing the Relevance of Data Protection Laws & Cyber Security, Legal recognition of Digital Evidence**,** Recognition of liability in the digital world, deciphering the Jurisdiction Issues in

Transnational Crimes**,** What is Cloud Computing & what is its regulatory structure, Issue of Communication Convergence, Relevance of Online Dispute Resolution in India.

V Reference :

☞ SURYA PRAKASH TRIPATHI, RITENDRA GOEL AND PRAVEEN KUMAR SHUKLA, INTRODUCTION TO INFORMATION SECURITY AND CYBER LAWS,WILEY INDIA PRIVATE LIMITED, 2014 (Technical Approach)

☞ APAR GUPTA,COMMENTARY ON INFORMATION TECHNOLOGY ACT,LEXIS NEXIS INDIA; (2nd ed.) (2011).

☞ PAVAN DUGGAL, CYBER LAW - AN EXHAUSTIVE SECTION WISE COMMENTARY ON THE INFORMATION TECHNOLOGY ACT ALONG WITH RULES, REGULATIONS, POLICES, NOTIFICATIONS ETC., Universal Law Publishing Co. Pvt Ltd., (2014)

☞ CYBER LAWS, JUSTICE YATINDRA SINGH, Universal Law Publishing Co., (2010). ☞ PAVAN DUGGAL, TEXTBOOK ON CYBER LAW, Universal Law Publishing Co. Pvt Ltd., (2014)

☞ AJIT NARAYANAN AND BENNUM (ed.): LAW, COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE.

☞ LINDA BRENNAN AND VICTORIA JOHNSON, SOCIAL, ETHICAL AND POLICY IMPLICATION OF INFORMATION TECHNOLOGY.

☞ KARNIKA SETH, COMPUTER INTERNET AND NEW TECHNOLOGY LAWS, LEXISNEXIS, (1st Edition) (2013).

☞ KAMATH NANDAN, LAW RELATING TO COMPUTERS INTERNET & E COMMERCE (A GUIDE TO CYBER LAWS & THE INFORMATION TECHNOLOGY ACT, 2000 WITH RULES & NOTIFICATION), (5th Edn., Universal Book Traders), (Reprint 2004).

☞ ARVIND SINGHAL AND EVERETT ROGERS, INDIA'S COMMUNICATION REVOLUTION : FROM BULLOCK CARTS TO CYBER MARTS.

☞ MIKE GODWIN, CYBER RIGHTS DEFENCING FREE SPEECH IN THE DIGITAL AGE

Additional Sources :

 Talwant Singh Addl. Distt. & Sessions Judge, Delhi, *Cyber Law & Information Technology*http://delhicourts.nic.in/CYBER%20LAW.pdf

 *New Crimes Under The Information Technology (Amendment) Act*http://www.ijlt.in/archive/volume7/5_Mohanty.pdf

 (A to Z of cyber crime by Asian School of cyber laws available at

http://ensaiosjuridicos.files.wordpress.com/2013/06/122592201-cybercrime.pdf) Louise Ellison and Yaman Akdeniz, I*nvestigating Cyber Law and Cyber Ethics: Issues, Impacts, and Practices, Cyber-stalking: the Regulation of Harassment on the Internet*http://www.cyber-rights.org/documents/stalking_article.pdf

 Cyber Crimes and Information Technology

 http://www.nalsar.ac.in/pdf/Journals/Nalsar%20Law%20Review-Vol.%204.pdf *A Study of the Privacy Policies of Indian Service Providers and the 43A Rules* http://cis-india.org/internet-governance/blog/a-study-of-the-privacy-policies-of-indian service-providers-and-the-43a-rules

 Relationship Between Privacy and Confidentiality

 http://cis-india.org/internet-governance/blog/relationship-between-privacy-and-confidentiality

 Availability and Accessibility of Government Information in Public Domain http://cis-india.org/accessibility/blog/availability-and-accessibility-of-government information-in-public-domain

 Cloud Computing in India: The current Legal regime and the main Issues and Challenges :http://www.indialawjournal.com/volume7/issue-1/article3.html

UEIL014 – Intellectual Property Rights

L	T	PW	C
3	-	-	3

Introduction to concept of property and intellectual property, introduction to TRIPS. Patent Law, concept and basis of protection, criteria of patentability and procedures of patent registration. Introduction to copyright law, subject matter of copy right and other related rights. Concepts and justification for trademarks protection, types of trademarks, procedure for registration, rights of trademark owner and infringement. Design law – basic and design justification, rights of design owners and protection against infringements. Concept of traditional knowledge, bio-piracy and bio-prospecting.

NIRMA UNIVERSITY
INSTITUTE OF LAW

Course Name: Introduction to Human Rights
University Elective

Credit: 3
Hours: 45

L	T	PW	C
3	-	-	3

Introduction:
Human Rights are those rights which every man or woman is entitled do by virtue of being born as a Human Being. So as to make these rights a reality, it is equally important to progressively create awareness and sensitivity to support these universally accepted human rights. The course is primarily aimed at sensitizing students on various issues of human rights. Students will also be guided through various human rights enforcing agency like National Human Rights Commission, United Nations and other international human rights organizations. The aim is to encourage students to think as human rights advocates in their examination of specific policy choices and to develop strategies designed to advance human rights in their private and public sphere.

Course Objective:

The object of the course is to:

- Form an understanding of theoretical dilemmas of human Rights Law.
- To identify different human rights by analyzing different rights independently in the light of its philosophical underpinnings.
- To have an understanding of the working of National, Regional and International human Rights protecting agencies.
- To sensitize students on emerging issues concerning Human Rights.

Course Learning Outcome:
At the end of the course the students will be able to:

- Know about the history and development of human rights Law.
- Understand various concepts, theories relating to human rights and human rights enforcement mechanisms
- Critically think on upholding of human rights and values and profess the same in their day-to-day interactions.

Syllabus:
Unit I: Jurisprudence of Humanrights

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