

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Electrical & Electronics Engineering, VI-Semester

EX-6001 – Communication Engineering

COURSE CONTENTS

Unit-1

Fourier series, Fourier Transform and its properties, Probability, random variables & their moments, their significance, convolution, auto correlation, cross Correlation & power spectral density, Gaussian & Rayleigh probability density Function, mean, variance & standard deviation, central limit theorem, voltage & Power decibel scales. Signal Processing: Types of signal, deterministic & random, periodic & non Periodic, analog & discrete, energy & power signals, Representation of sinusoid in different forms & their conversion

Unit-2

Need of modulation in a communication system, block schematic of a typical Communication system. AM modulation system, modulation index, generation & detection of AM wave, side bands & power content in an AM wave, DSB-SC, SSB, their methods of generation & detection, vestigial side Band modulation, AM transmitter block diagram, comparison of various AM system, modulation & demodulation circuits. Relationship between phase & freq. modulation, FM wave & its spectrum, phasor diagram of a narrow band FM signal, wide band FM, methods of generation & detection of FM, discriminators, pre-emphasis & de-emphasis, Stereophonic FM broadcasting, FMtransmitters.

Unit-3

TRF receiver & its limitations, necessity of heterodyning, super heterodyning Receivers, IF amplifiers, selection of intermediate frequency. RF amplifiers, detectors, AGC, AVC, FM receivers, AFC.

Unit-4

Nyquist sampling theorem, TDM, pulse modulations & PCM, quantization error, necessity of non linearquantizer, A-law, μ -law, FSK & PSK, QPSK, QAM. Source of noise, noise figure, noise bandwidth, effective noise temperature, performance of AM, FM & digital system in presence ofnoise.

Unit-5

Satellite system block diagram, satellite freq. bands, satellite multiple access Format like TDMA, FDMA, transponders, earth station & satellite eclipses, Link calculation

References:

1. Taub& shilling, Communication System,TMH
2. Singh &Sapre, Communication System, TMH
3. B.P. Lathi, Modern Digital and ana communicationsystem,
4. Simon Haykins, Communication System. JohnWilly
5. Wayne Tomasi, Electronic Communicationsystem.
6. Schaum outline Series, Analog and digitalcommunication
7. Martin S. Roden, Analog & Digital Communication System., DiscoveryPress.
8. John G. Prokis,MasoudSalehi, Gerhard Bauch, Contemporary communication sytems using MATLAB, Cengage learning 2004.

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Electrical & Electronics Engineering, VI-Semester

EX-6002 –Power System-II

COURSE CONTENTS

Unit -I

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

Unit-II

Power flow studies - Formulation of static power flow equations and solutions using Gauss-Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system – Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

Unit-III

MW Frequency control- Fundamental of Speed Governing, Modeling of Speed Control Mechanism, Primary ALFC, Closing of ALFC, Static & Dynamic Response to Primary ALFC, Speed Control Characteristics ,Fundamental of AGC,AGC in Isolated & Interconnected Power Systems, Modeling of the Tie line, Static & Dynamic response of two area system, Economic dispatchControl.

Unit-IV

Reactive Power & Voltage control –Protection & Absorption of Reactive Power Method of Voltage Control , Static VAR systems, Different types, Application ,characteristics, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltageregulators.

Unit-V

Power System Stability - Steady state, dynamic and transients stability, Swing equation , equal area criterion, solution of swing equation using step by step method modified Eulers method and Rnge-Kutta method, methods of improving transientstability.

References

1. I.J. Nagrath & D.P. Kothari, Modern Power System Analysis, Tata Mc Graw – Hill Publication Company Ltd 2nd edition.
2. C.L. Wadhwa, Electrical Power Systems, New Age International (P) Limited Publishers, 2nd edition 1998.
3. T.J.E. Miller, Reactive power Control in Electric Systems, John Wiley & Sons.
4. A Chakrawarti, Power System Analysis: Operation and Control PHI Learning 3rd edition
5. Elgerd O.I., “Electric Energy Systems Theory”, TMH, New Delhi, Second Edition 1983.
6. Prabha Kundur, “Power system stability and control”, Mc-Graw Hill Inc, New York, 1993.
7. Taylor C.W., “Power System Voltage Stability”, Mc-Graw Hill Inc, New York, 1993.
8. Nagrath IJ, Kothari D.P., “Power System Engineering”, Tata Mc-Graw Hills, New Delhi 1994.
9. Weedy B.M. “Electric Power System” John Wiley and Sons, 3rd edition.
10. P.S.R. Murthy, “Power System Operation and Control”, B S Publication
11. Power Generation, Operation and Control by A.J. Wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
12. T.K. Nagsarkar, M.S. Sukhiza, -“Power System Analysis”, Oxford University Press.
13. Economic Operation of Power Systems- by L.K. Kirchmayer Wiley Eastern Ltd.
W.e.f. :- July-2010 Academic Session-2010-11

List of Experiments:

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss-Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSAT, EDSA, MY POWER, ETAP etc).

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Electrical & Electronics Engineering, VI-Semester

EX-6003 – Microprocessor And Microcontrollers

UNIT 1

Microprocessor 8086 Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, mode, timing diagram, Memory interfacing, interrupts, Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays.

UNIT 2

Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251.

UNIT 3

Microcontroller 8051 Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, Accessing internal & external memories and different mode of operations, Memory organization, Addressing mode, instruction set of 8051 and programming.

UNIT 4

8051 Interfacing, Applications and serial communication 8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristor firing circuit, 8051 connections to RS-232, 8051 Serial communication, Serial communication modes, Serial communication programming, Serial port programming in C.

UNIT 5

Microcontroller 8096 Introduction to 16-bit Microcontroller, functional block-diagram, memory status, complete 8096 instruction set, classification of instruction set, addressing modes, programming examples using 8096, hardware features of 8096, parallel ports, control & status Registers, Introduction to 16/32 bit PIC microcontrollers and DSPIC.

Reference

1. Hall Douglas V., Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill.
2. A.K. Ray & K.M. Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw - Hill, 2009 TMH reprint..

3. Senthilkumar Saravananjeevananthan Shah, Microprocessors and Interfacing, Oxford University Press, 2012
4. Kenneth J. Ayala, The 8086 microprocessor: programming and interfacing the PC, Indian -edition, CENGAGE Learning.
5. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2005.
6. Kenneth J. Ayala, The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
7. V. Udayashankara and M.S. Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw - Hill, 2009.
8. McKinlay, The 8051 Microcontroller and Embedded Systems - using assembly and C, PHI, 2006 / Pearson, 2006.
9. Tim Wilmshurst, Designing embedded system with PIC microcontrollers Principles and applications. 2nd ed. 2011 Bsp books pvt ltd.

LIST OF EXPERIMENTS

1. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify Interrupt handling in 8051.
13. UART Operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix/Keyboard to 8051.
17. Data Transfer from Peripheral to Memory through DMA controller 8237/8257. Note: Minimum of 12 experiments to be conducted.

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Electrical & Electronics Engineering, VI-Semester

EX-6004 – Electronic Instrumentation

Unit-I

Introduction to CRO, Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

Unit-II

A.C. Bridge Measurement Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.

Unit-III

Transducers : Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description

Unit-IV

Signal Generators Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator Wave analyser Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.

Unit-V

Digital Instruments Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters., Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer type VM, comparison of Electronic & Digital Voltmeter, Digital Multimeter, Digital frequency meter, Time period measurement, High frequency measurement, Electronic counter, Digital tachometer, Digital PH meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display, Analog recorders, X-Y recorders. Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface.

List of Experiments:-

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using Schering bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R,L,C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
9. Measurement of Displacement using LVDT.
10. Measurement of speed of a Motor using photoelectric transducer.
11. Study & Measurement using pH meter.
12. Temperature measurement & Control using thermo couple & using thermistor.

References:

- 1) Albert. D. Helfrick, W.D. Cooper, Modern Electronic Instrumentation and measurement techniques, PHI.
- 2) Kalsi H.S., Electronic Instrumentation, TMH.
- 3) A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.
- 4) E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940
- 5) C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices and Systems Tata McGraw-Hill Publishing Company Ltd. B.C. Nakra, K.K. Choudhry, Instrumentation, Measurement and Analysis

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Electrical & Electronics Engineering, VI-Semester

EX-6005 – Elective II (1) (Utilization of Electrical Energy)

Unit-I

Illumination Engineering Nature of light, units, sensitivity of the eye, luminous efficiency, glare.

Production of Light; Incandescent lamps, arc lamps gas discharge lamps- fluorescent lamps- polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.

Unit-II

Heating, Welding And Electrolysis Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control. Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro beam welding, and electrical equipment for them. Arc furnaces transformer and welding transformers. Review of electrolytic principles, laws of electrolysis, electroplating, anodizing- electro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

Unit-III

Traction Special features of Traction motors, selection of Traction Motor, Different system of electric traction and their Advantages and disadvantages, Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion,

Unit-IV

Electric Drives Individual and collective drives- electrical braking, plugging, rheostatic and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

Unit-V

Introduction to Electric and Hybrid Vehicles Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.

References:

1. Open Shaw ,Taylor, .Utilization of electrical energy., Orient Longmans,1962.
2. H. Pratap, Art and Science of Utilization of Electrical Energy.
3. Gupta, J.B., Utilization of Elect. Energy ,Katariya and sons, New Delhi.
4. Garg, G.C., Utilization of Elect. Power and Elect.Traction.
5. N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect. Traction, New Age International.
6. Hancock N N, Electric Power Utilisation, Wheeler Pub.
7. Mehrdad,Ehsani,Yimin Gao,Sabastien.E. Gay,Ali Emadi, "Modern electric, hybrid electric and fuel cell vehicles" , CRC Press.

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Electrical & Electronics Engineering, VI-Semester

EX-6005 – Elective II (2) (Digital Signal Processing)

COURSE CONTENTS

Unit-I

Introduction to Digital Signal Processing. Discrete time signals & sequences, linear shift invariant systems, stability and causality. Linear-constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

Unit-II

Applications of z-transforms, solution of difference equations of digital filters. System function, stability criterion, frequency response of stable systems. Realization of digital filters - direct, canonic, cascade & parallel forms.

Unit-III

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

Unit-IV

IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev. Design of IIR Digital filters from analog filters. Bilinear transformation method, step & impulse invariance techniques. Spectral Transformations.

Unit-V

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response. Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters.

References:

1. Oppenheim & Schaffer, Digital Signal Processing, PHI.
2. John G. Proakis Digital Signal Processing: Principles, Algorithms, And Applications, 4/E
3. A. Anand Kumar Digital Signal Processing ,PHI
4. S.K. Mitra, Digital Signal Processing, TMH
5. Prof. N. Sarkar, Elements of Digital Signal Processing, Khanna Publication
6. Ludeman Fundamental of Digital Signal Processing, wileyindia
7. A. Antoniou, Digital Filters Analysis & Design, TMH

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Electrical & Electronics Engineering, VI-Semester

EX-6005 – Elective II (3) IPR- Intellectual Property Rights)

Course Objective

Acquaint the students with the basic concepts of Intellectual Property Rights; and sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR.

UNIT I Introduction

Introduction and Justifications of IPR, Nature of IP, Major forms of IP- *Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property.*

Major international documents relating to the protection of IP - *Berne Convention, Paris Convention, TRIPS.* The World Intellectual Property Organization (WIPO).

UNIT II Copyright

Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, *Civil, Criminal, Administrative*, Registration Procedure.

UNIT III Patents

Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI

Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.

Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

UNIT V Contemporary Issues & Enforcement of IPR

IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

Course Outcome:

1. Students will be able to understand Primary forms of IPR
2. Students will be able to assess and critique some basic theoretical justification for major forms of IP Protection
3. Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.
4. Students will be able to understand the registration procedures related to IPR.
5. Students will be exposed to contemporary issues and enforcement policies in IPR.

References:

1. P. Narayanan, Intellectual Property Law, Eastern Law House
2. . Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014
3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.
4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.
5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.
6. Prabuddha Ganguli, " Intellectual Property Rights" McGraw Hill Education, 2016.

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EX-6006 – Software/Simulation-II

Exercise 1

MATLAB Basic

simulation Mechanism and Simulation Tools, Starting and Ending MATLAB, MATLAB Desktop, Help Browser, Types of Files, Command Input Assistance, Operators and Special Characters, Variables and Arrays, Handling Arrays, Useful Built-in Functions, Control Structures, Input/Output Commands, File Handling

Exercise 2

Introduction to Plotting

The plot command, Formatting and Labeling a Plot, Multiple Plots, Adding Legend, Sub Plots, Plotting Complex Data, 2-D and 3-D Plots, Plotting a Function, Plot Editor, Interactive Plotting using Plotting Tool

Exercise 3

Programming in MATLAB

MATLAB Editor, MATLAB Programming, Debugging MATLAB Programs, MATLAB Debugger, Functions and Function Files, Differential Equation Solver, Symbolic Mathematics, Programming Examples

Exercise 4

Basic Electrical and Networks Applications

Analysis of Electrical Networks – Experiments based on Solution of Series-Parallel Circuits, Solution of system with linear equations - Experiments based on mesh and nodal analysis, Experiments for Validation of Network Theorems, Solution of Network Problems, Solution of First Order Differential Equation – Experiments for the study of Transients, Experiments for AC Signal Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response

Exercise 5

System Modeling using SIMULINK

Simulation Steps, Getting Simulink, Creating and Simulating a Simulink Model, Simulink Solution of Differential Equation, Assigning Variables, Observing Variables During Simulation, Storing/Saving Data, Linking M-file with Model file, Creating and Masking Sub-systems, Solution using Laplace Transform Approach, Solution using Laplace Transform Approach, Study of dynamic response, Simulation of Non-Linear System, Examples such as Simulink model to generate sine, cosine waveform and ramp signal

BOOKS

1. “Modelling And Simulation Using Matlab-Simulink”, 2011 Dr Shailendra Jain, Willey India.
2. “Matlab Programming”, Rudraprasad.

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Electrical & Electronics Engineering, VI-Semester

EX-6007 Creativity and Entrepreneurship Development

Course Objective:

- Understand and use tools for generating entrepreneurial ideas and problem solving.
- Understand and use tools for the selection of ideas.
- Understand and gain the skills that are needed to implement ideas in today's society
- Understand Entrepreneurship's part in process that includes idea generation and implementation.
- Understand the concept of Entrepreneurship and its place in today's society

Course Outcomes:

- Recognize an opportunity for a user group and frame an appropriate design challenge that addresses the need for the user.
- Practice observation, interview and empathy skills to evolve a thorough understanding of the needs of the user.
- Share and integrate team leanings.
- Generate, develop and describe creative ideas that address the design challenge.

Syllabus:

1. The concept of Entrepreneurship, its history and its place in society.
2. The concept of Entrepreneurship and its relation to concept of innovation.
3. Creative processes for idea generation and problem solving.
4. Business plan.
5. Role of creativity, innovation and business research.
6. Entrepreneurship opportunities in contemporary business environment.

Reference Books :

1. Dollinger M.J. "Entrepreneurship strategies and resources," 3rd edition Pearson Education New Delhi.
2. Panda, Shiba charan "Entrepreneurship development", Anmol publication New Delhi.
3. Richard Blundel & Nigel locket, "Exploring Entrepreneurship : practices & perspectives Oxford.
4. Charles E. Banford & Garry D. Bruton, "Entrepreneurship – A small business Approach, Mcgrawhill Education.
5. P. Narayana Reddy, "Entrepreneurship" : Text and cases, Cengage learning
6. Rajeev Roy, "Entrepreneurship" Oxford.