Autonomous Programme Structure of Third Year B. Tech. AY 2019-2020

Course Code	Course Title	Teaching Scheme Hours / Week			Examination Scheme				Marks	Credits
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 3101	Digital Communication	3	1	0	50	50	0	0	100	4
EC 3102	Microcontrollers	3	0	0	50	50	0	0	100	3
EC 3103	Electromagnetic Theory	3	1	0	50	50	0	0	100	4
OEHS 3101	Open Elective-I	3	0	0	50	50	0	0	100	3
PEEC 3101	Programme Elective-I	3	0	0	50	50	0	0	100	3
EC 3104	Digital Communication Laboratory	0	0	2	0	0	25	0	25	1
EC 3105	Microcontrollers Laboratory	0	0	4	0	0	0	50	50	2
EC 3106	Electronic Design Laboratory	0	0	2	0	0	25	0	25	1
PEEC 3102	Programme Elective-I Laboratory	0	0	2	0	0	0	25	25	1
AC 3101	Audit Course	0	0	2	0	0	0	0	0	0
	Total	15	2	12	250	250	50	75	625	22
	Grand Total	29			625				625	22

T. Y. B. Tech. Electronics and Telecommunication Engineering Semester –I

OEHS 3101: Open Elective I

1. Entrepreneurship Development
2. Introduction To Digital Marketing
3. Intellectual Property Rights
4. Project Management

PEEC 3101: Programme Elective-I
PEEC 3102: Programme Elective-I Lab

1. Mechatronics
2. Power Electronics
3. System Programming and Operating Systems.
4. Probability and Statistics

AC 3101: Audit Course: Employability Skills and Development

DEAN ACADEMICS
MKSSS's Cummins College
of Engineering for Women
Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg.
For Women, Karvenagar, Pune-52.

APPROVED BY
Governing Body Members
MKSSS's Cummins College
of Engineering for Women
Karvenagar, Pune-411052

EC 3101 DIGITAL COMMUNICATION

Teaching Scheme
Lectures: 3 Hours / Week
Tutorial: 1 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 4

Course Objectives:

1. Explain the functional block of Digital Communication System
2. Analyze PCM, DPCM, DM, ADM source coding techniques
3. Explain conversion of digital data to digital signal and ISI for reliable baseband transmission
4. Classify random processes
5. Describe binary and M-ary digital modulation techniques
6. Explain the optimum filter, correlation receiver and response of matched filter receiver in presence of noise
7. Describe the principle of spread spectrum modulation including pseudo – noise sequence

Course Outcomes:
After completion of the course, students will be able to
1. Describe waveform coding technique and evaluate bitrate, bandwidth and signal-to-noise ratio
2. Describe and interpret data formats, multiplexing, synchronization and Intersymbol interference for reliable baseband Transmission
3. Classify random processes in terms of mean, variance and autocorrelation
4. Describe and analyze bandpass modulation techniques along with their performance measure - bit period, bandwidth, signal space representation and Euclidian distance
5. Analyze the error probability of digital modulation techniques with matched filter and correlator
6. Illustrate the concept of Direct sequence and Frequency hopped spread spectrum

Unit I: Digital Transmission of Analog Signal (08)
Comparison between analog and digital communication, Block diagram of digital communication system, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error threshold, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, and Delta Sigma Modulation.

Unit II: Baseband Digital Transmission (08)
Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization, Inter-symbol interference, Equalization, Eye diagram.

Unit III: Random Processes (05)
Introduction, Mathematical definition of a random process, Stationary processes, Mean, Correlation & Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process.

Unit IV: Bandpass digital Techniques   **(09)**
Binary phase shift keying, Differential phase shift keying, Differentially Encoded PSK, Quadrature phase shift keying, M-ary PSK, Quadrature Amplitude shift keying, Binary frequency shift keying, M -Ary FSK, Minimum shift keying (MSK), and GMSK.

Unit V: Optimal reception of digital signal   **(06)**
Optimum Filter, Matched Filter, Probability of Error of Matched Filter, Correlation receiver. Calculation of error probability for BASK, BPSK and BFSK.

Unit VI: Spread Spectrum techniques   **(06)**
Pseudo noise sequences, spread spectrum, Direct sequence spread spectrum with coherent BPSK, Frequency hop spread spectrum and types, Processing gain.

Text Books:
1. Simon Haykin, Michael Moher, "**Communication Systems**", *Wiley*, (5th Edition), (2009).
2. Bernard Sklar, "**Digital Communications fundamentals and Applications**", *Prentice Hall P T R*, (2nd Edition), (2009).

Reference Books:
1. Donald L. Schilling, Goutam Saha, Herbert Taub, "**Principles of Communication system**", T*ata McGraw-Hill Education Pvt. Ltd,* (4th Edition), (2015).
2. A. B. *Carlson* and P. B. Crilly, "**Communication Systems**", *McGraw-Hill*, (5th Edition), (2002).
3. T. L. Singal, "**Analog and Digital Communication**", *Tata McGraw-Hill,* (1st Edition), (2012).
4. K. Sam Shanmugam, "**Digital and analog communication systems**", *Wiley Publication*, (1stEdition), (1996).

Online Resources:
1. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Dig%20Comm/New_in dex1.html
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-02-introduction-to-eecs-ii-digital-communication-systems-fall-2012/

EC 3102 MICROCONTROLLERS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the applications of microprocessors and microcontrollers
2. Introduce the architecture and features of typical microcontrollers
3. Learn the interfacing of real world I/O devices
4. Learn hardware and software development tools

Course Outcomes:
After completion of the course, students will be able to
1. Compare architectures for microprocessors and microcontrollers
2. Describe architecture of 8051 and PIC 18F microcontroller
3. Write assembly language codes for 8051 microcontroller
4. Write assembly language codes for interfacing on-chip peripherals viz. I/O ports, Timers, Serial communication of 8051 microcontroller
5. Write C language programs for interfacing peripherals viz. LCD and DC motor using PIC 18F

Unit I: Introduction to Microprocessor/Microcontrollers Architecture   (08)
Microprocessors and Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Architecture of a Microcontroller, Family members. Microcontroller Application Development tools: Simulator, Emulator, ISP, Cross assembler, Concept of RS 232 C, RS485, SPI bus and I2C bus standards.

Unit II: 8051 Architecture   (06)
MCS-51 architecture, Pin description, PSW, Internal and external memories, Counters and Timers, Serial communication, Stack and Stack Pointer, Port Structure, Interrupts.

Unit III: MCS-51 Addressing modes and Instructions   (06)
8051 Addressing modes, MCS-51 Instruction set and simple assembly language programs.

Unit IV: Real World Interfacing   (09)
Interfacing ADC, DAC, memory, Interfacing 8051 to LED, Interfacing 8051 to LCD, Interfacing 8051 to keypad, Interfacing 8051 to Stepper motor.

Unit V: PIC MICROCONTROLLER   (06)
Architecture of PIC 18X series, registers, memory organization, Interrupts, Timers, I/O port, Power down modes, Configuration bit settings.

Unit VI: Real world interfacing with PIC   (07)
Interfacing PIC 18F with Keypad, LCD, CCP, DC Motor (PWM), I2C bus for peripheral chip access, A/D converter, UART.

Text Books:

1. Mohammad Mazidi, Janice Mazidi and Rolin McKinlay, " **The 8051 Microcontroller and Embedded Systems using Assembly and C**", *Pearson Education*, (2nd Edition), (2014).
2. Mazidi, Mckinley, Causey, **"PIC Microcontrollers and Embedded Systems"**, *Pearson Education*, (1st Edition), (2013).

Reference Books:

1. Myke Predko, "**Programming and customizing the 8051 microcontroller**", *Tata McGraw Hill.* (2nd Edition), (2014).
2. Kenneth Ayala **"The 8051- Architecture, Programming and Applications"**, *West Publishing Company,* (3nd Edition), (2014).

Online Resources:

1. www.intel.com
2. www.microchip.com

EC 3102 ELECTROMAGNETIC THEORY

Teaching Scheme
Lectures: 3 Hours / Week
Tutorials: 1 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the basic mathematical concepts related to electromagnetic vector field
2. Explain the fundamentals of electrostatics and application of Electrostatics
3. Explain the concepts of Magnetostatics, Magnetic Flux density, Scalar and Vector potential and its applications
4. Discuss Maxwell's equations for static and dynamic fields
5. Evaluate Transmission Line parameters using Smith Chart

Course Outcomes:
After completion of the course, students will be able to
1. Apply the relevant law for solving basic problems of Electrostatics and Magnetostatics
2. Analyze the behaviour of Electrostatics and Magnetostatics fields in material space having homogeneous and heterogeneous medium.
3. Interpret Maxwell's equations (Point form and integral form) for static and dynamic field and calculate average power using Poynting theorem
4. Determine Transmission Line parameters using Smith Chart

Unit I: Fundamentals of Electrostatic Fields (09)
Coulomb's law and electric field intensity, Electric field due to point charge, Line charge and surface charge distributions, Electric flux density, Gauss's law and its application to differential volume element, divergence theorem.

Unit II: Applied Electrostatics (08)
Electric potential, Relation between E and V, Potential gradient Electric Dipole and flux lines, Energy density in electrostatic field, current and current density, Poisson and Laplace equation, Capacitance, Boundary conditions.

Unit III: Magnetostatics Fields (10)
Biot-Savart's Law, Ampere's Circuit Law, Applications of Ampere's Law, Magnetic Flux Density, Maxwell Equation, Strokes theorem, Magnetic Scalar and Vector Potentials, Forces Due To Magnetic Fields, Magnetic Boundary Conditions.

## Unit IV: Time varying Fields and Maxwell's Equations (06)
Faraday's Law, displacement current density, continuity equation of current, Maxwell's equations in phasor form Poynting theorem, Boundary conditions for time varying field, Retarded vector magnetic potential

Unit V: Transmission Line (09)
Line Parameters, general solution, distortionless line, infinite line, standing waves, input impedance of dissipationless line, open and short circuited lines, application of Smith Chart.
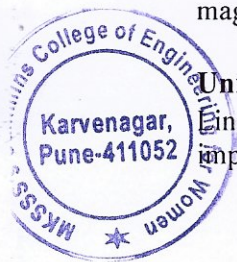
Text Books:

1. Matthew N. O. Sadiku, **"Engineering Electromagnetics"**, *Edition, Oxford University Press,* (4th Edition), (2010).
2. W. H. Hayt, J. A. Buck, **"Engineering Electromagnetics"**, *Revised Edition, Tata Mcgraw Hill,* (8th Edition), (2011).

Reference Books:

1. Edminister J. A., **"Schaum's Outline Series for Electromagnetics"**, *Tata Mcgraw Hill,* (4th Edition) , (2014).
2. John D. Kraus and Daniel A. Fleisch, **"Electromagnetics : With applications"**, *Singapore : McGraw-Hill*, (5th Edition), (2011).

Online Resources:

1. https://www.iiitd.edu.in/~mshashmi/ECE_230_2015/Lecture_Slides/Lect_1_2015.pdf
2. http://nptel.ac.in/downloads/115101005/ (from NPTEL)
3. http://www.engppt.com/2009/12/fundamentals-of-electromagnetic-theory.html
4. https://www.rose-hulman.edu/class/ee/HTML/ECE340/PDFs/electrostatics.pdf

PEEC 3101 MECHATRONICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Discuss the concepts and key elements of Mechatronics system
2. Explain principles and characteristics of Sensors and Transducers
3. Describe working principle of Hydraulic and Pneumatic systems and its applications
4. Give example of applications of Mechatronics Systems

Course Outcomes:
After completion of the course, students will be able to
1. Identify key elements of Mechatronics System and its representation in terms of block diagram
2. Classify Sensors and Transducers according to their applications
3. Design Signal Conditioning circuit for given Sensors/Transducers
4. Explain working principle and applications of Hydraulic and Pneumatic Systems
5. Apply concept to Interface Hydraulic/Pneumatic System components for given task
6. Develop Mechatronics systems for automation

Unit I: Elements of Mechatronics Systems   (06)
Introduction to Mechatronics, key element/components, level of Mechatronics system design, phases of Mechatronics design process, integrated design approach, Advantages, and disadvantages of Mechatronics systems, Mechanical components: cam, gears, gear-train, servomechanism, and its application

Unit II: Sensors and Transducers   (10)
Overview of Sensors and Transducers, classification, and their Characteristics. Temperature: Thermistor, RTD, semiconductor (AD590, LM35, LM75), IR sensor, Force: strain gauge, Load Cell, Pressure: Strain gauge, Piezoelectric, Displacement/Position: potentiometer, LVDT, proximity, optical encoder, Ultrasonic transducer, Level and Flow: ultrasonic transducer, Vibration and acceleration: piezoelectric accelerometer

Unit III: Signal Conditioning and Data Acquisition Systems   (06)
Signal conditioning: its necessity, Amplification, filtering and Impedance Matching, protection, 4-20 mA Transmitters, Data Acquisition system: its necessity, components of DAQ, data conversion, and data signal transmission and its representation.

Unit IV: Hydraulic and Pneumatic Actuating System   (08)
Introduction to Hydraulic Actuating system, Physical Components of Hydraulic systems, types of Hydraulic actuators and their applications. Introduction to Pneumatic Actuators systems, Physical Components of a Pneumatic Systems, types of Pneumatic Actuators/Cylinders and its applications. Comparison of hydraulic and pneumatic actuators.**Valves:** Pressure relief, Pressure regulator and directional Control Valve (3/2 Valves, 4/2 Valves, 5/3 Valves)

Unit V: Introduction to Electrical Actuators and Electro-Mechanical Actuators   (06)
Selection criteria and specifications of stepper motors, servomotors, solenoid valves, Solid State relays and Electromechanical relays. Electro-Pneumatic: Physical Components of Electro-Pneumatic systems.

Unit VI: Mechatronics Systems Applications   (06)
Mechatronics Systems in Automobile, Engine Management systems, Antilock Brake systems (ABS), washing machine, pick and place robot, introduction to CNC Machines.

Text Books:
1. Bolton W., **"Mechatronics Electronic systems in Mechanical and Electrical engineering"**, *Pearson Educatio Ltd.,* (6th Edition), (2016).
2. K. P. Ramachandran, G. K. Vijayaraghavan and M.S. Balasundaram, **"Mechatronics-Integrated Mechanical Electronic Systems"**, *Wiley Publication*, (1st Edition), (2008).
3. David Alciatore and MaichaelB Histand, **"Introduction to Mechatronics and Measurement Systems"**, *Tata McGraw Hill*, (4th Edition), (2013).

Reference Books:
1. Doeblin E.O., **"Measurement System-Application and Design"**, *TMH, New Delhi*, (4th Edition), (2004)
2. Mahalik N. P., **"Mechatronics - Principles, Concepts and Applications"**, *TMH, New Delhi*, (2th Edition), (2014)
3. Devdas Shetty and Richard A. Kolk, **"Mechatronics System Design"**, *Thomson India Edition*, (1st Edition), (2007).

Online Recources:
1. http://nptel.ac.in/courses/112103174/

PEEC 3101   POWER ELECTRONICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the power devices structure and characteristics
2. Elaborate the line synchronization and isolation circuit/techniques
3. Compare the output voltage waveforms of power converters for R and R-L loads
4. Calculate the performance parameters of power converters
5. Explain power converter applications
6. Explain the protection circuits for the power devices

Course Outcomes:
After completion of the course, students will be able to
1. Explain the need of power devices, their structure and characteristics
2. Design gate drive circuits for Power Devices
3. Analyze power converters for output voltage, Output current, Reactive power
4. Determine the power converter performance parameters
5. Describe power converter applications
6. Design protection circuits for power devices

Unit I: Power Devices   (06)
SCR- Construction, turn on mechanism, Static and Dynamic Characteristics, Specifications, Gate-cathode characteristic , Firing circuits, Isolation Techniques, Power MOSFET, IGBT- Construction and Gate Drive Circuits.

Unit II: Phase Controlled Rectifiers   (10)
Concept of Line and Forced Commutation, Introduction to Forced Commutation circuits for SCR   (No Derivations only operation and waveforms), Analysis of Single phase Semi converters and Full Converters for R and R-L load, Effect of Freewheeling Diode, Working of Three phases Converters for R load.

Unit III: AC Voltage Controllers   (05)
Single Phase AC voltage Controller for R and R-L load, Three Phase AC voltage Controller for R load, Light dimmer, resistance welding, induction heating.

Unit IV: Inverters   (08)
Working principle of Single phase Half Bridge and Full Bridge inverters for R and R-L load, Analysis of Performance parameters, Three phase Bridge inverters for R load (120° and 180° mode Operation), PWM Inverters, Working of ON Line and Off Line UPS.

Unit V: Choppers   (08)
Circuit Diagram, waveforms and operation of Step Down chopper for R and R-L load, Different Control Strategies for the output voltage control, Step up chopper, 2-quadrant and Four Quadrant Choppers, flyback Converters, Block diagram and working of SMPS.

Unit VI: Protection Circuits for Power Devices   **(05)**
Over current, over Voltage protection for power devices, Snubbed circuit for SCR, Cooling mechanism for power devices.

Text Books:

1. M. H. Rashid, **"Power Electronics Circuit, Device and Application"** *PHI New Delhi,* (3rd Edition), (2009).
2. M. D. Singh and K. B. Khanchandani, **"Power Electronics"** *TMH, New Delhi,* (2nd Edition), (2008).
3. Ned Mohan, T. M.Undeland, and W.P. Robbins, **"Power Electronics Converter Application and Design"** *John Wiley and Sons, (*3rd Edition), (2009).

Reference Books:

1. M. S. Jamil Asghar, **"Power Electronics"**, *PHI, New Delhi,* (1st Edition), (2011).
2. P. C. Sen, **"Power Electronics"**, *John Wiley and Sons,* (1st Edition), (2008).

Online Recourses:

1. www.nptelvideos.in/2012/11/power-electronics.htm

PEEC 3101 SYSTEM PROGRAMMING AND OPERATING SYSTEM

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objective

1. Explain the fundamentals of system programming
2. Introduce the algorithmic design aspects of assembler, macro processor and compiler
3. Explain the concept of linkers and loaders
4. Explain the steps in software development along with the software tools and the code optimization techniques
5. Explain the types and functions of Operating system

Course Outcomes:

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

1. Explain the language processors: assembler, macro processor, compiler, linkers and loaders
2. Analyze the program development steps using software tools and interpret code optimization techniques
3. Describe the operating system concepts and functions
4. Analyze and evaluate the memory management techniques
5. Explain the file system concepts and mobile OS

Unit I : Basics of system programming and Macroprocessor (06)

Language processors: Language processors and processing activities
Data structures for language processing: Search data structure, Allocation data structures.
Macro Processor: Macro definition and call, macro expansion, Nested macro calls, advanced macro facilities, Design of macro pre processor.

Unit II : : Translators : Assembler, Compilers and Interpreters (08)

Assembler: Assembly language programming, simple assembly scheme, pass structure of assembler, design of two pass assembler
Compilers and Interpreters : Phases of compilation, memory allocation, code of optimization, Interpreters and comparison with compilers

Unit III : Linkers and Loaders and Software tools (06)

Linkers and Loaders: Basic loaders functions, absolute loaders, relocation loader, direct linking loader, dynamic linking and loading
Software tools: Software tools for program development, editors, debuggers, programming environment, user interfaces

Unit IV : Introduction to Operating System (OS), Process Management and (10) Deadlocks

Operating System: OS services, system calls and its types, UNIX operating system structure
Process Management: Process states, process control block, processes scheduling and scheduling algorithms
Threads: Single and multi threaded processes, types of threads, multithreading models, comparison of threads with process

Inter process communication: Shared memory and message passing mechanism, direct and indirect communication

Process synchronization: Critical section, semaphores, classic problems of syncronization namely bounded buffer problem, reader-writer problem and dining philosophers problem

Deadlocks: Necessary conditions for deadlock, deadlock prevention, deadlock avoidance, Banker's algorithm, recovery from deadlock

Introduction to mobile OS, comparison of various mobile OS and comparison of mobile OS with the UNIX based OS

Unit V : Memory Management (06)

Basics of memory management, swapping, memory allocation, paging, segmentation, virtual memory, demand paging, page replacement, page replacement algorithms namely First In First Out(FIFO) and Least Recently Used (LRU)

Unit VI: File System and implementation (06)

File System : file attributes, file operations, file types, file access methods, file directories, file protection, file system structure, file system implementation, free space management

Text Books:

1. D.M. Dhamdhere, "**Systems Programming and Operating System**", *Tata McGraw Hill,* (2nd Edition), (2009).
2. Siberschatz A; Galvin P.B; Gagne G, "**Operating System Concepts**", *Wiley India Pvt. Ltd.,* (8th Edition), (2010).
3. P. K. Dixit, "**Android**", *Vikas Publishing*, (1st Edition), 2014

Reference Books:

1. J. J. Donovan, "**Systems Programming**", *Tata McGraw Hill,* (1st Edition), (1991).
2. Andrew S. Tanenbaum, "**Modern Operating System**", *Pearson,* (4th Edition), (2015).
3. Alfred Aho, Ravi Sethi & Jeffrey D. Ullman, "**Compilers – Principles, techniques and tools**", *Pearson Education India Ltd.,* (2nd Edition), (2007).

Online Resources:

1. Assemblers : http://slideplayer.com/slide/7276157/
2. System Calls and its types: https://youtu.be/x6XTxhY1jZQ
3. Compiler, Interpreter, Assembler, Linker and Loaders : https://youtu.be/4sPWotthkgw
4. How OS works : https://www.youtube.com/watch?v=85_XLP1CKYs

PEEC 3101 PROBABILITY AND STATISTICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain Axioms, rules in Probability and Distributions
2. Solve numerical on various Statistical Measures
3. Evaluation and interpretation of descriptive Statistics
4. Design and Analysis of Experiments
5. Explain Hypothesis tests

Course Outcomes:
After completion of the course, students will be able to
1. Solved problems based on Probability and Bayes Theorem
2. Identify Distributions in Data
3. Calculate Mean, Variation, Regression, Correlation on given data
4. Design and Analyze experiments and apply hypothesis tests
5. Draw inferences from statistical analysis of data
6. Describe Principle Component Analysis and Independent Component Analysis and their applications

Unit I: Probability   (06)
Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence, Probability distribution.

Unit II: Review of Basic Statistical Measure   (08)
Introduction, Measures of Central Tendency: Arithmetic Mean, Weighted Arithmetic Mean, Median, Geometric and Harmonic Mean. Measurement of Variation: Quartile, Average and Standard Deviations, Coefficient Variation. Measurement of Skewness.

Unit III: Design and Analysis of Experiment   (08)
Introduction, ANOVA, Completely Randomized design, Latin Square design, Duncan's Multiple Range Test.

**Unit IV: Tests of Hypotheses**   (10)
Introduction, Tests of Hypothesis Concerning Means, Hypothesis Concerning Proportions, Hypothesis Concerning Variations (Chi-square and F-Tests), Chi-square Test for checking Independent of Categorized Data, Goodness of Fit Test

Unit V: Multivariate Analysis   (10)
Introduction, Correlation Analysis, MANOVA, Forecasting, Linear Regression, Discrimination Analysis, Factor Analysis, Principle Component Analysis and Independent Component Analysis.
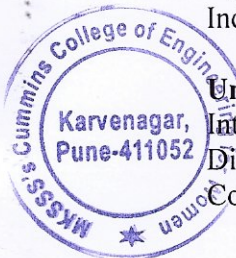
Text Books:

1. R. Panneerselvam, **"Research Methodology"**, *PHI Learning Private Limited,* (2nd Edition), (2014).
2. P. Z. Peebles, *"Probability, Random Variables and Random Signal Principles"*, *Tata McGraw-Hill,* (4th Edition), (2013).
3. A. Papoulis, S. U. Pillai, *"Probability, Random Variables and Stochastic Processes"*, *Tata McGraw-Hill,* (4th Edition), (2002).

Reference Books:

1. S. M. Ross, **"Introduction to Probability and Statistics for Engineers and Scientists"**, *Elsevier Publication,* (5th Edition), (2014).
2. Jay I. Devore, **"Probability and Statistics for Engineers and Scientists"**, *Elsevier Publication,* (5th Edition), (2014).
3. E. Rukmangadchari, E. K. Reddy, **"Probability and Statistics"**, *Pearson India Pvt. Ltd,* (1st Edition), (2015).
4. Rohatgi A. K., Md. E. Saleh, **"Introduction to Probability and Statistics"**, *Wiley Publication Pvt. Ltd.,* (3rd Edition), (2015).

Online Recourses:

1. http://nptel.ac.in/courses/112103174/

EC 3104 DIGITAL COMMUNICATION LAB

Teaching Scheme
Lectures: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objective

1. Explain pulse code modulation techniques and Companding
2. Explain Delta modulation and Adaptive delta modulation
3. Analyze data format and their spectral analyses
4. Verify shift keying techniques such as FSK, PSK and QPSK experimentally.
5. Verify properties of PN-Sequence

Course Outcome

After completion of the course, students will be able to

1. Compare bit-rate, signal-to-noise ratio, Quantization error and design implementation for waveform coding techniques
2. Interpret the data format for bit pattern and explain Inter Symbol Interference
3. Compare and measure bandwidth and bit-rate of digital modulation techniques
4. Illustrate balance and run-length property of PN-sequence

List of Experiments:

1. To measure Bit-rate, Signal to noise ratio and Quantization error for PCM.
2. To measure and plot slope overload and Grannular noise in Delta modulation.
3. To measure and plot slope overload and Grannular noise in Adaptive Delta modulation.
4. To interpret line codes (NRZ, RZ, Polar RZ, Bipolar (AMI), Manchester) and interpret spectral analysis for a given bit pattern
5. To observe BFSK waveform in presence of noise and measure bandwidth.
6. To observe BPSK and QPSK waveforms, compare and measure its bit rate and bandwidth.
7. Write program for calculation and plotting the error probability of BPSK, QPSK and QAM.
8. To observe and verify properties of PN-sequence.
8. Analyze parameters of codec IC's OR Design and implement PCM Modulator.

EC 3105 MICROCONTROLLERS LAB

Teaching Scheme
Practical: 4 Hours / Week

Examination Scheme
Practical : 50 Marks
Credits: 2

Course Objectives:

1. Explore software development tools for 8051 and PIC 18F Microcontrollers
2. Assembly language programming
3. Interfacing of real world I/O devices with 8051 microcontroller
4. Interfacing of real world I/O devices with PIC 18F microcontroller

Course Outcomes:

After completion of the course, students will be able to
1. Write assembly language codes using instructions of 8051 microcontroller
2. Write assembly language codes for interfacing on-chip peripherals viz. I/O ports, Timers, Serial communication of 8051 microcontroller
3. Write assembly language codes for interfacing external peripherals viz., LED, DAC ,7-segment display
4. Write assembly language codes for interfacing external peripherals viz., LCD, Keypad, and stepper motor
5. Write C language programs for interfacing peripherals viz. LCD and DC motor using PIC 18F

List of Experiments:

1. Write programs for Mathematical Calculator/ Temperature Conversion/Smaller-Greater numbers, Factorial of a number.
2. Program for Data transfer from Internal to Internal / Internal to External Memory.
3. Program to sort the numbers in ascending /descending order.
4. Different programs to interface LEDS — (flashing in different patterns, BCD Counter)
5. Generation of various waveforms using DAC interface to 8051.
6. Interfacing of Multiplexed 7-segment display (counting application)
7. Interfacing of LCD to 8051 (4 bit and 8 bit modes)
8. Interfacing of Stepper motor to 8051 using Timer delay
9. Interfacing 4X4 keypad to 8051 and displaying key pressed on LCD
10. Interfacing serial port of 8051 to PC.
11. Write a program for interfacing switch, LED, relay & buzzer with PIC.
12. Generation of PWM signal for DC Motor control using PIC.
13*. Simulation of interfacing switch, LED, relay & buzzer with PIC using Proteus.
14*. Interface analog voltage 0-5V to internal ADC of PIC and display the value on LCD.

Note: * Higher difficulty level Programs

EC 3106 ELECTRONIC DESIGN LAB

Teaching Scheme
Lectures: 2 Hours / Week

Examination Scheme
Oral : 25 Marks
Credits: 1

Course Objectives:

1. Apply fundamental concept of electronics to design electronic system.
2. Inculcate circuit designing skills and to use modern design tools.
3. Highlight the importance and significance of customer specification/requirements.
4. To learn electronics circuit function verification with EDA tools.

Course Outcomes:
After completion of the course, students will be able to
1. Apply the fundamental concepts and working principles of electronic devices to design electronic systems
2. Interpret data sheets and thus select appropriate components and devices
3. Design an electronic system/subsystem in the area of regulated power supplies and validate its performance
4. Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition System and validate its performance by simulating the same with EDA tools
5. Design, Develop, Built, Test and Demonstrate Linear Power Supply
6. Write and submit a report on the Linear Power Supply

1. Linear Regulated Power Supply: (04)
Design, Built and Test Linear Power Supply for Laboratory use should be selected from any one type given below:
   a. Single Polarity (Variable/Fixed)
   b. Dual Polarity (Variable/Fixed)
   c. Dual Tracking (Variable/Fixed)

Scope of Design :
1. Proper selection of transformer, rectifier and filter, with its appropriate ratings.
2. Justify selection and design of regulator circuit.
3. Current boosting using external pass/parallel transistor.
4. Over current/ short-circuit, over voltage, thermal protection.
5. Indication of voltage, current and mode of operation on panel by meter or display.
6. Indicators for over voltage and over current.
7. Thermal considerations- Heat Sink calculations.
8. Component list in the form of bill of material.
9. Performance analysis

2. Data Acquisition system (DAS) (04)
Design and simulate Data Acquisition System in the field of Instrumentation, Automotive Electronics, Bio-medical etc. It should have at least two channel input.

Scope of Design :
1. Selection of appropriate signal sensing scheme.
2. Design of signal conditioning circuit.

3. Selection of suitable A to D converter
4. Selection of Microcontroller with appropriate interfacing circuit
5. Indication of parameter using LED/LCD Display.
6. Component list in the form of Bill of Material.
7. Simulation to verify performance of DAS

3. Build and Test Electronic hardware for assignment 1 and Simulation of   **(04)**
assignment 2 with EDA tool

Build working model of the design and prepare report for Linear Power Supply.

References:
Data and Application Manuals and Application Notes from:
1. RS Component Catalog.
2. National Semiconductor regulator design manual.
3. Analog Devices Data Manual.
4. Motorola, "Linear / Switch mode power supplies".
5. Motorola Power Transistors and Thyristors data hand book.
6. BEL Transistor Manual
7. Tower's Data Manual.
8. "PIC 16XX data book"
9. Texas instruments, "Linear interface and applications circuit design"
10. "ATMEL micro controller data book"
11. Intel Peripheral Manual.

Reference Books:
1. Paul Horowitz, **"Art of Electronics"**, *Cambridge University Press,* (2nd Edition), (2008).
2. B. S. Sonde, **"Power Supplies"**, *McGraw-Hill Education,* (1st Edition), (1980).
3. B. S. Sonde, **"Introduction to System Design Using Integrated circuits"**, *New Age Publication (P) Ltd.,* (2nd Edition), (2003).
4. Sergio Franco, **"Design with Operational amplifiers and analog Integrated circuits"**, *McGraw-Hill Education,* (3rd Edition), (2003).
5. Muhammad Ali Mazidi and Janice Gillispie Mazidi, **"The 8051 Microcontroller and Embedded Systems"**, *Pearson Education Asia,* (2nd Edition), (2009).
6. Muhammad Ali Mazidi , **"PIC Microcontroller and Embedded System"**, *Pearsion Education,* (3rd Edition), (2008).
7. Irving M. Gotlib, **"Power Supply Design"**, *McGraw-Hill Education,* (4th Edition), (1992)

DEAN ACADEMICS
MKSSS's Cummins College
of Engineering for Women
Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg.
For Women, Karvenagar, Pune-52.

APPROVED BY
Governing Body Member
MKSSS's Cummins Colleg
of Engineering for Wome
Karvenagar, Pune-41105

PEEC 3102 MECHATRONICS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Measure of displacement, velocity, liquid level, liquid flow
2. Identify and interface components of electro-hydraulic/electro-pneumatic and hydraulic/pneumatic systems
3. Study of data acquisition system

Course Outcomes:
After completion of the course, students will be able to
1. Measure load, velocity, flow and level using analog and digital sensors
2. Interface sensor with data acquisition system and monitor data trending
3. Interface components of electro-hydraulic/electro-pneumatic and hydraulic/pneumatic to build circuits.
4. Develop and demonstrate application of Mechatronics system using suitable hardware.

List of Experiments:
1. Weight measurement using Load Cell.
2. Velocity measurement using optical encoder.
3. Liquid flow measurement using Turbine flow sensor.
4. Liquid level measurement using capacitance sensor.
5. Interfacing any two sensor with Data Acquisition System and observe data trending.
6. Interface hydraulic/ electro - hydraulic system component to actuate single acting and double acting actuator.
7. Interface pneumatic/ electro-pneumatic system component to actuate single acting and double acting cylinders.
8. Design and implement Mechatronics system for any application.

PEEC 3102 POWER ELECTRONICS LAB

Teaching Scheme   **Examination Scheme**
Practical: 2 Hours / Week   Practical : 25 Marks
                                                        Credits: 1

Course Objectives:

1. Demonstrate V-I characteristics of power devices
2. Analyze gate drive circuits of the power devices
3. Observe and analyze the output voltage of power converters for R and R-L loads
4. Demonstrate the applications of power converters
5. Examine the power converter using simulation tool

Course Outcome

After completion of the course, students will be able to

1. Measure the important parameters of power devices
2. Test synchronization at every stage in the gate driving circuits
3. Compare the theoretical and practical values of output voltage of the power converters for R and R-L loads with different values of firing angles.
4. Analyze waveforms at different stages of gate drive circuits and at the output of power conversion circuits
5. Analyze the power converter performance using simulation tool

Tools and Platforms: Power Electronics experimental kits , Multisim

List of Experiments:

1. To plot   static characteristic of SCR for various gate current values. Measure holding current and Latching current for the   SCR used.

2. a) Examine the output of single phase fully controlled bridge rectifier for R, R-L load and R-L with fly wheel diode.
   b) Demonstration of single phase half controlled bridge rectifier for R and R-L load.
3. To plot transfer characteristic and output characteristic of MOSFET.
4. To inspect and analyze different waveforms of single phase full bridge Inverter
5. To test the gate drive circuit and analyze the output of Step down chopper.
6. To observe the waveforms of the triggering circuit and measure the output voltage of AC Voltage controller.
7. To perform converter based DC drive for Permanent magnet DC Motor
8. To test the performance of any one power converter using Multisim.

PEEC 3102 SYSTEM PROGRAMMING AND OPERATING SYSTEM LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Implementation of language processors.
2. Introduction to Linux / Ubuntu OS and implementation of algorithms of OS functions

Course Outcome
After completion of the course, students will be able to
1. Use basic Linux/ Ubuntu OS commands and demonstrate the steps in Andriod OS application development
2. Implement and analyze stages of compilation of a C language program
3. Implement, analyze and evaluate the OS functions
4. Implement, analyze and compare memory management techniques

Tools and Platforms: C Language on Ubuntu OS
List of Experiments:
1. Implement basic Linux/ Ubuntu Commands
2. Write a shell script on Linux/ Ubuntu OS
3. Implement and analyze stages of compilation in C program
4. Write C Program to implement Lexical Analyzer for simple arithmetic operation to create output tables.(a. Identifier Table b. Literal Table c. Symbol Table d. Arithmetic table e. Keyword table)
5. Implement process scheduling algorithms First Come First Serve (FCFS) and Shortest Job First (SJF)
6. Implement Bankers Algorithm for deadlock detection and avoidance
7. Implementation of page replacement algorithm First In First Out (FIFO) / Least Recently Used (LRU)
8. Develop an application based on Android OS

PEEC 3102 PROBABILITY AND STATISTICS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Execute program on probability and statistical methods.
2. Evaluating and Interpolation of data.

Course Outcome
After completion of the course, students will be able to
   1. Compute Probability of an event
   2. Find and plot distribution on a given data
   3. Calculate the measure of central tendency for set of data
   4. Perform ANOVA test
   5. Execute PCA on given data

Tools and Platforms: MatLab/ R-Programming
List of Experiments:
   1. Determine Probability of an event.
   2. Plot CDF and PDF for set of data.
   3. Calculate measures of Central Tendency for set of data.
   4. Calculations of Variance for set of data.
   5. ANOVA test for set of data.
   6. To apply Chi Square test to given data.
   7. To perform Regression analysis given set of data.
   8. Analysis of multivariate data using PCA/ICA.

OEHS 3101   ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme
Lectures: 3 Hours / Week
Credits: 3

Examination Scheme
In Semester: 50 Mark
End Semester: 50 Marks

Course Objectives:
Students will be able to
1. Understand the fit between individual entrepreneurial ambitions
2. Select a problem worth solving
3. Identify customers
4. Develop a solution for your customers' problems and problem solution
5. Build and demonstrate an MVP (Minimum Viable product)
6. Structure a business model around the problem, customer, and solution and present Business Model Canvas

Course Outcomes:
This course will give the students the foundational experience of the entire cycle of entrepreneurship, through a combination of theory and practice.

At the end of the course, the students shall be able to:
1. Describe what it takes to be an entrepreneur
2. Analyze business opportunities and the basics to create, launch and manage new businesses
3. Develop Business Model for their Idea/Problem
4. Create MVP (Minimum Viable Product)

Module 1: Introduction   (3)
Discover yourself, Principles of Effectuation, Identify your entrepreneurial style

Module 2: Problem Identification and Idea generation   (4)
Identify Problems worth Solving, Introduction to Design Thinking, Generate ideas that are potential solutions to the problem identified

Module 3: Customer Segmentation   (7)
Customer identification, Market, Creative solution, Unique Value proposition

Module 4: Business Model Canvas   (4)
Types of business models, Business Plan documentation, Risk identification

Module 5: Validation   (9)
Identification of MVP, Solution development, Building products/services, Build-measure-learn loop for development, Market fit of solution

Module 6: Money (5)
Revenue streams, Pricing and cost, Venture financing, Investor expectations

Module 7: Team building (3)
Shared leadership, role of good team, Collaboration tools and techniques

Module 8: Marketing and sales (3)
Positioning, Channels and strategies, Sales planning

Module 9: Support (4)
Project management, Planning and tracking, Business Regulation

Course contents available at: https://staging.learnwise.org/ - Through a Cloud Technology Platform – WF Learn Wise Platform

PDF documents can be downloaded from the website for the distribution to students.

Sample References:

1) Effectuation: https://necrophone.com/2014/01/20/effectuation-the-best-theory-of-entrepreneurship-you-actually-follow-whether-youve-heard-of-it-or-not/

2) Value Proposition: https://www.youtube.com/watch?v=jZN6CUieuOQ&list=PLw540Wq5kay866m6A6xl7KOwE_Ah7is4m

3) The Lean BMC: https://www.youtube.com/watch?v=FjB_e7UO1hc

4) Define your MVP: https://startups.fb.com/en-in/categories/development/

5) Designing Experiments: https://www.youtube.com/watch?v=WiMZWCg1Hu8&t=111s

6) Beating the Competition: https://www.youtube.com/watch?v=46uP6vOj5G0

7) Google : Think branding: https://www.youtube.com/watch?v=1l2CUjkg0ug

Introduction to Digital Marketing

Teaching Scheme	**Examination Scheme**
Lectures: 3	In Semester: 50 marks
	End Semester: 50 marks
	Credits:3

Course Objective:

1. Interpret Digital marketing campaign strategy

2. Explain social media and its role in marketing strategy through various channels which it operates

3. Explore search engine optimization

4. Explain concepts related to mobile marketing

Course Outcome:

After successfully completing the course students will be able to

1. Explore methods to illustrate website and webhosting concepts

2. Develop a marketing plan for product or service by integrating social media platforms to generate leads

3. Examine mobile marketing strategies to connect with customers

4. Demonstrate importance of organic ranking through SEO

Unit: I   Overview of Digital Marketing   (08)

Introduction to Digital Marketing,Understand customer needs, Benefits of Digital marketing, Digital marketing platforms and Strategies, Comparing Digital with Traditional Marketing,Latest Digital marketing trends, What is Domain Name, Types of Domain, Web Hosting Concepts, Domain/Hosting Business,introduction to wordpress

Unit: II   Digital Advertising with Google AdWords   (08)

Introduction to Paid Marketing, Google Account setup, Account Structure, Campaigns settings, AdGroup setup, Keyword Match Types, Keyword Research Tools, Understanding Ad Auction, What is Quality Score, My Client Centre, Google AdWords Editor Tool, Interface Tour and BillingSettings

Unit: III   Social Media Marketing   (08)

Introduction to Social Media, Integrating Social Media with Other Disciplines, Facebook Marketing, Facebook account setup, Personal account properties, Facebook marketing strategy, Facebook business page setup, Types of Business pages, Cover photo designing, Page management options, twitter and Instagram marketing

Unit: IV   Mobile Marketing   (06)

Introduction to Mobile Marketing and m-commerce, create mobile app,case study:market potential of mobile commerce.

Unit: V   Search Engine Optimization   (06)

Introduction to Search Engines, On-Page Optimization, Off-Site Optimization, Social media monitoring Tool

Unit: VI   Case study and Future Trends in Digital marketing   (06)

Text Books:

1.Sudhir Sreedhara, **DigitaMarketing**, *Lulu.com, 2015*

2.Vandana Ahuja, **Digital Marketing,** *Oxford University Press, 2015*

3.Banjamin Mangold, **Google Adwords and Google Analytics**, *loves data 2018*

4.Alex Michael, Ben Salter, **Mobile Marketing**, *Butterworth-heinemann, 2006*

5.Richard stokes, **Pay per click**, *second edition, Entrepreneur Press*

6.Steven Samson **Search Engine Optimization - SEO 101: Learn the Basics of Google SEO in One Day** *Publication:CreateSpace Independent Publishing Platform , USA ©2015*

ISBN:1517336945 9781517336943

7.Jenifer Grappone,Gradiva Couzin, Search Engine optimization An Hour a Day Third Edition, Wiley publishing Inc.

8.EricEnge, Stephen Spencer, Jessie Stricchiola, Rand Fishkin, **The Art of SEO**, *second Edition , O'Reily Media*

Reference Books:

1.Ian Dodson, **The Art of Digital Marketing:** *Wiley,Apr 2016*

2.Sira. R Bowden **Beginners Guide Digital Marketing Part 2:** *Mobile Marketing, BookRix, 2016*

websites:

1. https://www.searchenginejournal.com/seo-guide/panda-penguin-hummingbird/
2. https://www.lynda.com/Analytics-tutorials/Online-Marketing-Fundamentals/188429-2.html

Test-1(25mks)	Test-2(25mks)	Endsem(50mks)
MCQ/Quiz	Pen-paper test	Case-study/Projects/Assignments

OEHS 3101 Intellectual Property Rights

Teaching Scheme
Lectures : 3 Hrs/week
Credits : 3

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks

Course Objectives :

To facilitate the learners to -
1. Overview of Intellectual Properties (IP) regime in India and International arrangements
2. Types of IP as Patents, Copyrights, Trade Secrets etc.
3. Process and steps involved in filing Intellectual Properties
4. Understand intricacies involved in drafting patent applications

Course Outcome :
By the end of this course, the students should be able to -
1. Demonstrate the concepts of Intellectual Property Rights, patents and other forms of IP
2. Compare and apply type of Intellectual Property
3. Analyze the patentability of inventive step by searching patents
4. Construct patent drafts for given Patent specification
5. Understand the advances in patent law, in national and international scenario

Unit-I : Introduction (6)
Intellectual Property (IP) Vs. Physical property, History of IP in India, Importance of IP, Patentable inventions / art, types of IPR-Patents, Copyright, Industrial Design, Trade Marks etc., Basic principles of IPR, Economic Importance of Intellectual Property Rights, IPR-ownership, morality, public order, traditional knowledge

Unit-II : Patents (8)
Introduction to Patents, Patentable Inventions as per the Indian Patent Act, Patent searching, types of Patent applications, Procedure for filing application (National and International), Patents offices, Register of Patents, Rights and obligations of patentee, Term of patent, Patent of Addition

Unit-III : Drafting of patent applications (8)
Fundamentals of drafting, structure of the patent specification-Field of invention, prior art, patent classifiations, technical advance, Invention Disclosure Form, problem solution statement, claims, preamble, body, summary

Unit-IV : Transfer and Infringement of Patent Rights (6)
Working of patents, compulsory licensing, Revocation of patents, Transfer of Patent Rights-Assignment, License; Concept of infringement, Infringement of Patents Rights, Infringement of Patents and its remedies, Patent of Addition

Unit-V : Introduction to other types of IPs (8)
Copyright, Trade Marks, Geographical Indications, Industrial Designs, Trade Secrets, Layout designs of Integrated Circuits : Introduction, Work protected by, ownership and

infringement, Application process

Unit-VI : Advances in IPR (6)
International Patenting, Patent Co-operation Treaty (PCT), Commercialization of Patents, Advances in IPR

References:

Text Books
1. Niraja Pandey, Khushdeep Dharni, "Intellectual Property Rights", PHI
2. N. S. Rathore, "Intellectual Propoerty Rights: Drafting,Interpretation of Patents Specification and Claims" , New India Publishing Agency

Reference Books
1. Venkataraman M., "An introduction to Intellectual property Rights", Venkataraman M.
2. Mishra, "An introduction to Intellectual property Rights", Central Law Publications
3. R Anita, V. Bhanoji Rao, "Intellectual property Rights, - A Primer", Eastern book Company
4. R Puri, "Practical approach to intellectual propert Rights"
5. P Ganguly, "IPR unlisting the knowlege economy"

Web references
1. NPTEL course material on "Patent Drafting for Biginners" - https://onlinecourses.nptel.ac.in/noc18_hs17/preview
2. IP India : www.ipindia.nic.in/
3. WIPO, World Intellectual property Organization - www.wipo.int/
4. Intellectual Property (IP) Policy | USPTO - https://www.uspto.gov/intellectual-property-ip-policy

OEHS 3101: Project Management

Teaching scheme   Examination Scheme
Lectures: 3 hrs/week   In-sem: 50 Marks
Credits : 3   End-Sem: 50 Marks

Course Objectives:
1. To introduce concepts of Project management
2. To discuss life cycle of real life projects and activities involved in projects
3. To understand risks involved in a project

Course Outcomes:
After successful completion of the course the student will be able to:
1. Identify scope of a project and lifecycle of a project
2. Develop a plan for a project
3. Determine schedule of a project
4. Assess risks involved in a project
5. Estimate budget of a project
6. Adapt project management tools and techniques

Unit I Introduction:
Definition of project, Objectives of Project Management, Classification of projects, Life cycle phases of the project. Project management and Project manager, Role and responsibilities of the project manager, Stakeholder Identification, team building

Unit II Project Planning
Project Planning: Introduction and basic requirements, establishing project objectives, Statement of work (SOW), project specifications, Work Breakdown structure (WBS).

Unit III Project Scheduling
Project scheduling: Introduction and basic requirements, milestone scheduling, Network
Scheduling techniques: PERT(Program Evaluation Review Technique), CPM(Critical Path Method), GANNT chart, Schedule control

Unit IV Risk Assessment and Management:
Risk Management Planning, Risk identification, Qualitative Risk analysis, Quantitative Risk analysis, Risk response planning, Risk monitoring and controlling

Unit V Project Cost Estimation
Resource Planning, Cost Estimating, Cost Budgeting, Budget control, Earned Value Analysis, Project Audits, Project closure

Unit VI Tools and Techniques for Project Management

Project Management tools, International Project Management, Collaborative development, Planning Quality Management, Quality metrics, Techniques for Quality Control (statistical control, six sigma, ISO)

Text Books :
1. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), *PMI.*

2. PROJECT MANAGEMENT A Managerial Approach, Jack R. Meredith**,** *John Wiley & Sons*

Reference Books:
1. Morris, P. W. G., Pinto, J. K., **The Wiley Guide to Managing Projects**, 2004, *John Wiley & Sons*
2. Phillips, J.PMP **Project Management Professional Study Guide**, *McGraw-Hill, 2003.*

Website:
https://www.pmi.org
https://www.ipma.world/

AC3101 : Employability Skills *and* Developement – I

Teaching Scheme:
Lectures: 2 Hrs/Week   [**Section A** - 1 Hr/Week , **Section B** - 1 Hr/Week]

Pre-requisites: High school level Mathematics ,English grammar and Verbal ability

Course Objectives:
1. To enhance the analytic and problem solving ability of students.
2. To develop English language proficiency .
3. To make them aware of communication skills necessary for getting employed and being successful in a profession.

Course Outcomes:
After successful completion of the course , students will be :
1. Able to solve Numerical ability questions without using calculators.
2. Equipped with essential language skills (written, verbal and non-verbal)
3. Able to exhibit their presentation skill and be ready for facing interviews.

Section A :Quantitative Aptitude – I [Numerical Ability]   **(24)**

Use of Paper pencil practice sessions and online test on the following topics :
1. Divisibility, Remainder Theorem
2. Surds & Indices
3. LCM & HCF
4. Percentage
5. Average
6. Ratio Proportion
7. Profit Loss
8. Set Theory (Venn Diagram)
9. Alligation
10. Time & Work
11. Speed Distance Time
12. Boats & Trains
13. Equations
14. No. Series, AP GP HP
15. Simple & Compound Interest
16. Clocks
17. Calenders
18. Relations & Age
19. Permutation & Combination
20. Probability
21. Verbal & Non Verbal Reasoning
22. Data Interpretation

Section B - Communication Skill – I   **(20)**
   [Verbal Ability (VA) and Reading Comprehension (RC)]

Use of Language Lab and Paper pencil test on each topics below.
1 . Spotting Errors, Synonyms, Antonyms,
2. Selecting Words, Spellings, Sentence Formation,
3. Ordering of Words, Sentence Correction, Sentence Improvement,
4. Completing Statements,Ordering of Sentences,

5. Paragraph Formation, Closet Test, Comprehension,
6. One Word Substitutes, Idioms and Phrases,
7. Change of Voice, Change of Speech, Verbal Analogies
8. Resume Preparation as per College format.
9. Public Speaking : Book review, Extempore, Debates
10. Presentation skills on Seminar /Mini Project
11. Group Discussion on following topics (any three) :
12. Technical Topics
13. Current Topics, Economics & Business, Management Topics, Creative Topics
14. Social Topics, Politics, Sports, Education
15. Job Interviews : Conduct mock interviews, Interview questions
16. Business Etiquettes and Body language

Text Books:
1. Wren and Martin, "English grammar and Composition", S. Chand publications.
2. Abhijeet Guha, "Quantitative Aptitude for competitive exams", McGraw-Hill Education

Books for references:
1. Basic Managerial Skills for all E. H. McGrath, Eastern Economy Edition, Prentice hall India.
2. Personality Development and Group Discussions, Barun K. Mitra, Oxford University Press
3. Group Dissussions and Interview Skills : Priyadarshi Patnaik : Foundation Books : Cambridge University Press
4. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success: Gopalaswamy Ramesh, Mahadevan Ramesh
5. Abhijeet Guha, "Quantitative Aptitude for competitive exams", McGraw-Hill Education

Reference Website:
1. https://www.indiabix.com/
2. https://www.aptitude-test.com/
3. https://www.careerride.com/
4. https://www.freshersworld.com/

ADVANCED COURSE IN ENTREPRENEURSHIP :
FROM BUSINESS MODEL TO PRODUCT MARKET FIT

Core Contact hours: 45 Flex Contact Hours: 15
Assignments (done after class) are 30 hours

Assessment plan:
Class Participation and Assignments - 30%
Quizzes - 10%
Final Exam - 30%
Capstone Project - 30%

Prerequisite:

Basic Course or a student who has a Business Model and an MVP

Course Objectives:

1. To understand the importance of growth and to be able to chart a path towards growth
2. To revisit your business model
3. To give a growth orientation your customer acquisition, operations, revenue and sales strategy
4. To list and comply with the requirements relating to regulatory compliance
5. To be able to effectively pitch your venture to potential stakeholders

Course outcomes:

Students will be able to

1. Validate the business model designed for product market fit
2. Formulate and test the business strategies for the growth of business
3. Comply with the requirements relating to regulatory compliance for the business proposed
4. Pitch their venture to potential stakeholders

Description about course:

In this course, students will learn about how to achieve product market fit.
They will revisit their business model and look for opportunities for growth in their customer segments, in their channels, and in the other blocks of the Business Model and validate it. Then they will set their traction goal and chase that during the course. They identify channels, enhance their revenue streams and focus on sales. They will learn to work on their financial model and make a pitch deck. They will build their Sales, Ops, Hiring, and Technology Plan. Potential show stoppers such as Compliances, Legal and Registrations will be covered as well.

Course Contents:

Module I: Getting Ready for Growth

• Why growth stage is different compared to startup phase
• Why Product-Market fit is not enough
• Case study
• To assess readiness for growth
•To chart a growth path

Module II: Expanding Customer Base

Revisit your business model and develop few variants (more business model types)
• Identify additional customer segments that your solution can address
• Evaluate business models for the new customer segments
• Relook at the Problem Statement (can you expand the scope and scalability of your business by repositioning your problem statement?)
• Explore additional ways to monetize

Module III: Scaling

• How to gain traction beyond early customers
• Defining traction (in quantifiable terms) and identifying the most important metrics to measure traction
• Calculate cost of new customer acquisition
• Estimate your customer lifetime value (LTV)
• Identifying waste in your operations and focusing your team on what is important for traction

Module IV: Channels and Strategy:

• Identify Channels using Bulls Eye Framework
•Measuring the effectiveness of selected channels
• Budgeting and planning

Module V: Growing Revenues

• Stabilizing key revenue streams
• Developing additional revenue streams (licensing, franchising)
• Exploring new channels and partnerships

Module VI: Sales Planning:

Understanding why customers buy and how buying decisions are made; listening skills
• Sales planning, setting targets
•Unique Sales Proposition (USP); Art of the sales pitch (focus on customer needs, not on product
• Follow-up and closing a sale; Asking for the sale

Module VII: Strengthening Sales:

Building a professional sales team
• Sales compensation and incentives
• Sales planning, setting targets

Module VIII: Improving Margins

Testing price elasticity
• Optimizing costs and operational expenses
• Advanced concepts of unit costing

Module IX: Financial Modeling:

• Financial modeling of your venture's growth
• Analyzing competitor and peer's financial models

Module X: Legal :

• Overview of legal issues and their impact on entrepreneurs
• Importance of getting professional help (legal and accounting)
• Importance of being compliant and keeping proper documentation
• Patents and Intellectual property
• Trademarks

Module XI: Mentors, Advisors, and Experts:

• The importance of a Mentor and how to find one
• Role of business advisors and experts for specific targets in your growth plan

References:

https://lms.learnwise.org/

http://www.unstoppablegrowth.com/core/where_to_grow.asp?groupCode=9

https://hbr.org/2003/12/growth-outside-the-core

https://www.boardofinnovation.com/business-revenue-model-examples/

https://hbswk.hbs.edu/item/do-bonuses-enhance-sales-productivity-a-dynamic-structural-analysis-of-bonus-based-compensation-plans2

http://www.mca.gov.in/MinistryV2/registrarofcompanies.html

https://cleartax.in/s/annual-compliance-checklist-startups

http://www.wipo.int/portal/en/index.html

https://www.inc.com/young-entrepreneur-council/why-mentors-and-advisors-are-must-haves-for-every-founder.html