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


<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecture</th>
<th>Tutorial</th>
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<th>In Semester</th>
<th>End Semester</th>
<th>Oral</th>
<th>Practical</th>
<th>Marks</th>
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**Grand Total**: 29 625 625 22

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**OEHS 3101: Open Elective I**

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

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**PEEC 3101: Programme Elective-I**

1. Mechatronics
2. Power Electronics
4. Probability and Statistics

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**AC 3101: Audit Course**: Employability Skills and Development
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, Intersymbol 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
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
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
Pseudo noise sequences, spread spectrum, Direct sequence spread spectrum with coherent BPSK, Frequency hop spread spectrum and types, Processing gain.

Text Books:

Reference Books:

Online Resources:
1. [http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Dig%20Comm/New_index1.html](http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Dig%20Comm/New_index1.html)
2. [https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-02-introduction-to-eeCS-ii-digital-communication-systems-fall-2012/](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)

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)

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:

Reference Books:

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
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
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

Unit IV: Time varying Fields and Maxwell’s Equations
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
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:

Reference Books:

Online Resources:
2. http://nptel.ac.in/downloads/115101005/ ( from NPTEL )
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)

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)
Unit V: **Introduction to Electrical Actuators and Electro-Mechanical Actuators**  

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

**Text Books:**

**Reference Books:**

**Online Recources:**
1. [http://nptel.ac.in/courses/112103174/](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)

Unit III:  AC Voltage Controllers (05)

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

Over current, over Voltage protection for power devices, Snubbed circuit for SCR, Cooling mechanism for power devices.

Text Books:

Reference Books:

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
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
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
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 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 synchronization 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

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

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:

Reference Books:

Online Resources:
2. System Calls and its types: [https://youtu.be/x6XTxhYIjZQ](https://youtu.be/x6XTxhYIjZQ)
4. How OS works: [https://www.youtube.com/watch?v=85_XLP1CKYs](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)

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)
Text Books:

Reference Books:

Online Recourses:
1. http://nptel.ac.in/courses/112103174/
EC 3104 DIGITAL COMMUNICATION LAB

Teaching Scheme
Lectures: 2 Hours / Week

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 Granular noise in Delta modulation.
3. To measure and plot slope overload and Granular 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

Exam 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.
5. Indication of voltage, current and mode of operation on panel by meter or display.
6. Indicators for over voltage and over current.
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 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.
4. Motorola, “Linear / Switch mode power supplies”.
6. BEL Transistor Manual
8. “PIC 16XX data book”
9. Texas instruments, “Linear interface and applications circuit design”

Reference Books:
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
Practical: 2 Hours / Week

Examination Scheme
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 Android 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
Revenue streams, Pricing and cost, Venture financing, Investor expectations

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

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

Module 9: Support
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:


2) Value Proposition: https://www.youtube.com/watch?v=jZN6CUieuOQ&list=PLw540Wq5kay866m6A6x17KOwE_Ah7is4m

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

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

5) Designing Experiments: https://www.youtube.com/watch?v=WiMZWcGlHu8&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
Lectures: 3

Examination Scheme
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)

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 Billing Settings

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:
3. Benjamin Mangold, *Google Adwords and Google Analytics*, Love's Data 2018

ISBN: 1517336945 9781517336943

Reference Books:
websites:


<table>
<thead>
<tr>
<th>Test-1(25mks)</th>
<th>Test-2(25mks)</th>
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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
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
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
Fundamentals of drafting, structure of the patent specification-Field of invention, prior art, patent classifications, technical advance, Invention Disclosure Form, problem solution statement, claims, preamble, body, summary

Unit-IV: Transfer and Infringement of Patent Rights
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
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**

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

**References:**

**Text Books**

**Reference Books**
4. R Puri, “Practical approach to intellectual property”
5. P Ganguly, “IPR unlisting the knowledge economy”

**Web references**
1. NPTEL course material on “Patent Drafting for Beginners” - https://onlinecourses.nptel.ac.in/noc18_hs17/preview
2. IP India : www.ipindia.nic.in/
3. WIPO, World Intellectual property Organization - www.wipo.int/
OEHS 3101: Project Management

Teaching scheme
Lectures: 3 hrs/week
Credits: 3

Examination Scheme
In-sem: 50 Marks
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

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

**Reference Books:**

Website:
https://www.pmi.org
https://www.ipma.world/
AC3101 : Employability Skills Development – 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]

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. Calendars
18. Relations & Age
19. Permutation & Combination
20. Probability
21. Verbal & Non Verbal Reasoning
22. Data Interpretation

Section B - Communication Skill – I
[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:

Books for references:
4. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success: Gopalswamy Ramesh, Mahadevan Ramesh

Reference Website: 1. https://www.indiabix.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/


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

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


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

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