Detailed Syllabus
Lecture-wise Breakup

Course Code	18B11EC312	**Semester** Odd **(specify Odd/Even)**	**Semester** 5th **Session** 2020 -2021 **Month from** August-December
Course Name	Electromagnetic Field Theory		
Credits	4	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Ashish Gupta, Vishal Saxena
	Teacher(s) (Alphabetically)	K. Nisha, Neetu Joshi, Raghvenda Kumar Singh, Reema Budhiraja,

COURSE OUTCOMES		**COGNITIVE LEVELS**
C312.1	Recall concepts of vector calculus to solve complex problems and relate among different coordinate systems. Explain the basic principles of electrostatics and magnetostatics and relate the electric and magnetic fields using Maxwell's Equations.	Understanding Level (C2)
C312.2	Illustrate the propagation of electromagnetic waves in different medium and their reflection and transmission parameters. Distinguish among different wave polarizations.	Applying Level (C3)
C312.3	Estimate the current, voltage and power for the different types of transmission lines, determine reflection parameters. Demonstrate the Waveguide theory, Wave equations, and evaluate different waveguide parameters.	Evaluating Level (C5)
C312.4	Classify and compare the different parameters associated with the antenna and also interpret the radiation mechanism.	Understanding Level (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introductory material	Review of scalar, vector fields and coordinate systems (cylindrical and spherical coordinate) Electrostatic and Magneto static Fields	8
2.	Maxwell's Equations	Inconsistency of Amperes law, Continuity equation, Displacement current, Maxwell's equations, Boundary conditions.	4
3.	Electromagnetic Waves	Wave propagation in free space, Conductors and dielectrics, Polarization, Plane wave propagation in conducting and non conducting media, Phase velocity, Group velocity; Reflection at the surface of the conductive medium, Surface Impedance, Depth of penetration.	11
4.	Poynting Vector and Power	Poynting theorem, Poynting Vectors and power loss in a plane conductor.	2
5.	Transmission Lines	Transmission line equations, characteristic impedance, open and short circuited lines, standing wave and reflection losses. Impedance matching.	7
6.	Wave guides	Rectangular wave guides Modes in rectangular coordinates, characteristics, power transmission and losses.	6
7.	Radiation and Antennas	Scalar and vector potentials. Radiation from a current filament, Antenna characterstics, radiation pattern, radiation	4

		intensity, directivity and power gain.	
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	M.N.O. Sadiku, S.V. Kulkarni, *Principles of Electromagnetics*, Oxford Press, 6th Edition, 2016.
2.	W. H. Haytt, J.A. Buck, M. J. Akhtar, *Engineering Electromagnetics*, McGraw Hill Education, 8th Edition, 2014.
3.	S. Salivahanan, S. Karthie, *Electromagnetic Field Theory*, McGraw-Hill Education, 2nd Edition, 2019.
4.	C.A. Balanis, Advanced Electromagnetics, Wiley Publishers, 2nd Edition, 2012.
5.	S.C. Mahapatra, S. Mahapatra, *Principles of Electromagnetic*, McGraw Hill Education, 2nd Edition, 2015.
6.	A.R. Harish, M.Sachidananda, aAntennas and Wave Propagation, Oxford University Press, 2015.

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15EC312	**Semester Odd (specify Odd/Even)**	**Semester 5th Session 2020-21 Month from July to December**
Course Name	Electromagnetic Field Theory Lab		
Credits	**1**	**Contact Hours**	**2**

Faculty (Names)	**Coordinator(s)**	Ashish Gupta, Monika
	Teacher(s) (Alphabetically)	Bhagirath Sahu, Neetu Joshi, Raghvenda Kumar Singh, Reema Budhiraja, Vishal Narain Saxena

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	To observe electromagnetic wave propagation in X-band waveguide and draw the dispersion curves. To simulate a rectangular waveguide and calculate its cut-off frequency.	Understanding (Level II)
CO2	Calculate and evaluate the various parameters such as VSWR and load impedance of transmission lines.	Applying (Level III)
CO3	Measure the microwave power in Gunn oscillator, directional coupler and also measure the radiation patterns of the antenna.	Evaluating (Level V)
CO4	Design and simulate the different antenna parameters using HFSS software and verify with the measured results.	Create (Level VI)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Rectangular Waveguide Parameters	To determine the frequency and wavelength in a rectangular waveguide working in TE10 mode.	**1**
2.	Rectangular Waveguide Parameters	To study the propagation of wave in X-band waveguide and draw the ω-β plot.	**1**
3.	Rectangular Waveguide Parameters	Determine the VSWR /input VSWR & corresponding impedance of the device at a spot frequency in X-band and also verify by using smith chart.	**2**
4.	Design of Rectangular Waveguide	Determine experimentally the broader dimension of rectangular waveguide using microwave test bench at X-band of microwave frequency.	**1**
5.	I-V characteristics of a Gunn-Diode	To study Gunn Oscillator as a source of microwave power and hence to study and plot its I –V characteristics.	**3**
6.	Measurement of Received Power	To study the variation of field strength of radiated wave, with distance from a transmitting antenna.	**3**
7.	Radiation Pattern	To plot and study the radiation pattern of Dipole and Yagi antenna.	**3**
8.	Measurement	Determine experimentally the propagation characteristics of following microwave devices operating at X-band using microwave test bench	**3**

		a. Directional coupler, b. Magic Tee.	
9.	Simulation	Design and Simulation of Rectangular Waveguide and plot the S- Parameters to obtain the cut-off frequency.	**1**
10.	Simulation	Design, Simulation, Optimization and characterization any planar Antenna on ANSYS HFSS.	**4**
11.	Measurement of Input parameters of the antenna	Measurement of Input parameters of an Antenna using Vector Network Analyzer.	**4**

Evaluation Criteria

Components	**Maximum Marks**
Viva 1(Mid Sem Viva)	20
Viva 2(End Sem Viva)	20
Assessment Components	30
Attendance	15
Lab Record	15
Total	**100**

Project Based Learning: Students will learn to design a rectangular waveguide for a given frequency range and to study the configuration of Electric and Magnetic waves. They can also see the number of supporting modes for a given rectangular waveguide and operating frequency. They will be able to operate and characterize different microwave devices such as Gunn Diode, Directional Coupler, magic tee etc. Students can also plot and measure the radiation patterns of the given antennas. Most importantly students will be able to simulate and characterize the designed antennas and waveguides with the help of Ansys High Frequency Structure Simulator (HFSS) tool. After designing and subsequent fabrication, antennas can be measured using vector network analyzer available in the lab. Thus students can make different projects by using the knowledge gained from the mentioned experiments.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	M.N.O. Sadiku, S.V. Kulkarni, *Principles of Electromagnetics*, Oxford Press, 6th Edition, 2016.
2.	C.A. Balanis, Advanced Electromagnetics, Wiley Publishers, 2nd Edition, 2012.
3.	A.R. Harish, M.Sachidananda, aAntennas and Wave Propagation, Oxford University Press, 2015.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC313	**Semester** …Odd Semester **(specify Odd/Even)**	**Semester Vth, Session** 2020 -2021 **Month from August to Dec**
Course Name	Microprocessor and Microcontroller		
Credits	**3**	**Contact Hours**	

Faculty (Names)	**Coordinator(s)**	Smriti Bhatnagar, Varun Goel
	Teacher(s) (Alphabetically)	Atul Kr. Srivastava, Smriti Bhatnagar , Varun Goel

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-1.1	Recall the basics of digital circuits, specifications and applications.	C1
C330-1.2	Familiarize with the basics of 8 bit, 16 bit and 32 bit microprocessor / Microcontroller, and its internal organization.	C2
C330-1.3	Use the knowledge of different instructions of 8085 microprocessor/ 8051 Microcontroller to write the various programs in assembly language.	C3
C330-1.4	Interface the memory chips and peripheral chips, LED, LCD, Keyboard, Motor and Sensors with 8085 microprocessors and Micro controllers.	C4

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Digital Electronics & Microprocessor	Digital Circuit Parameters (Open collector outputs, Tristate outputs, I/O source and sink, Fan-in and Fan-out, Propagation delay, Figure of merit), Pipelining & Parallel Processing, Cache Memory, Memory Management, Virtual Memory System, Introduction to Microprocessors, Evolution of Microprocessor, Microprocessor Systems with Bus Organization, Concept of Memory & its internal Organization, Memory Expansion, Classification of Memories & their types.	6L
2.	Detailed Study of Microprocessor 8085	Features of 8085, Microprocessor Architecture in detail, Pin Diagram in detail, De-multiplexing Address & Data Bus, Generation of Control Signals, Interfacing with Memory & I/O Device with timing diagram, Instruction fetching, execution & data transfer operation, Programmer's Model & Instruction Set, Different Formats for Instruction, Opcode & Data, Addressing Modes, Complete Instruction Set (Data transfer, Arithmetic & Logical, Branch & Stack), Assembly language programming, Looping, Counting & Indexing techniques, Interrupt System of 8085, Polling &	15L

		Interrupt, Basic definition of Interrupts, Interrupt Structure & their types, Masking/Unmasking of Interrupts, Interrupt driven I/O, Microprocessor (8086, 80186, 80286, etc.), Architecture Advancement of *Programming Examples*	
3.	Detailed Study of 8051 Microcontroller	Microprocessor Versus Microcontrollers, Microcontrollers for Embedded Systems, Embedded Versus External Memory Devices, CISC Versus RISC Processors, Harvard Versus Von-Neumann architecture, 8051/8031/8052 Microcontroller (Basic architecture, Pin configuration, Memory organization (registers and I/O ports), Assembly language programming (addressing modes and instruction set), Timers and Interrupts, Serial Communication, *Programming Examples.*	12L
4.	Real World Interfacing with Microcontroller	Interfacing of single LED, Blinking of LED with timer and without timer, Interfacing of push-button, LED & 7-segment display, Intelligent LCD Display, Interfacing of intelligent LCD display, Interfacing of Matrix Keyboard to control 7-segment display, Stepper Motor & DC Motor, Interfacing with stepper & DC motor, Relay Interfacing, Different Sensor Interfacing, IR & LDR Sensor, DTMF, 8255 PPI Chip (Pin Configuration, Block Diagram, Operating Modes, Memory Mapped I/O & I/O Mapped I/O), Application of 8255 - 7 segment, Traffic Light Controller etc.	10L
		Total number of Lectures	**43 L**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Muhammad Ali Mazidi, "The 8051 microcontroller and Embedded Systems using Assembly and C", 2nd Edition, Pearson Education, 2008.
2.	R. S. Gaonkar, "Microprocessor Architecture Programming & Applications", Prentice Hall, 2002.

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**20B12EC211**	**Semester Odd**	**Semester** 5th **Session** 2020-21 **Month from** Jul 20 to Dec 20
Subject Name	**Introduction to Digital Image and Video Processing**		
Credits	**4**	**Contact Hours**	**3+1**

Faculty (Names)	**Coordinator(s)**	Bhawna Gupta
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES Upon completion of the course, the student will be able to:		**COGNITIVE LEVELS**
C330-2.1	Understand the image formation model, digital image display science and storage formats.	Understanding [C2]
C330-2.2	Apply and analyse image transformations for the processing in different domains.	Analysing [C4]
C330-2.3	Apply image enhancement or image restoration to improve or restore the quality of the image for various applications such as bio-medical image processing.	Analysing [C4]
C330-2.4	Analyse video and apply processing on Videos for enhancement and restoration.	Analysing [C4]
C330-2.5	Apply compression algorithms and analyse the effect of compression on various parameters of image and video.	Analysing [C4]

Module No.	**title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Human visual system and Image perception	Image sensing and acquisition visual perception, Noise in images,	3
2.	Image digitization, Display and Storage	Image sampling and quantization, Pixel connectivity	3
3.	Image Transforms	Unitary transforms, 2D DFT, DCT, KL and Harr transform.	5
4.	Image analysis	Edge and line detection, Hough transform, segmentation, feature extraction, classification image texture analysis, Color models and color image processing.	7
5.	Image Enhancement	Gray level transformation, histogram processing, Smoothing and sharpening spatial Filters, Smoothing and sharpening frequency domain filters.	7

6.	Image Restoration	Linear degradation model, inverse and Wiener filtering.	5
7.	Video Display and Storage	Principle of color video camera, video camera, digital video, Sampling of video Signals, Video Frame classifications, I, P and B frames, Digital Video formats	3
8.	Video Processing	Introduction to Video analysis, enhancement and restoration.	5
9.	Image and Video Compression	Lossless and Lossy compression standards, Image/Video Quality parameters	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance, Performance. Assignment/Quiz)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R.C. GONZALEZ & R.E. WOODS: Digital Image Processing, 3rd ed. Pearson Education Ltd, 2008.
2.	W.K. PRATT: Digital image processing: PIKS scientific inside, John Wiley, 2007.
3.	A. K. JAIN: Fundamentals of Digital Image Processing, Information and System Sciences Series, Prentice Hall, 1989.
4.	A. M. TEKALP: Digital Video Processing, Signal Processing Series, Prentice Hall, 1995.
5.	J.W. WOODS: Multidimensional Signal, Image and Video Processing and Coding, 2nd ed. Academic Press, 2012.

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**17B1NEC735**	**Semester Even**	**Semester** 5th **Session** 2020-21 **Month from** Jan 21 to July 21
Subject Name	**Information Theory and Applications**		
Credits	**4**	**Contact Hours**	**3+1**

Faculty (Names)	**Coordinator(s)**	Dr. Alok Joshi
	Teacher(s) (Alphabetically)	Dr. Alok Joshi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C430-5.1	Understand the concept of probability, its relation with information, entropy, and their application in communication systems.	Understanding Level (C2)
C430-5.2	Identify theoretical and practical requirements for implementing and designing compression algorithms.	Analysing Level (C4)
C430-5.3	Analyze the relationship between bandwidth and capacity of communication channels and its importance in real life communication systems.	Analysing Level (C4)
C430-5.4	Analyze the need for channel coding in digital communication systems.	Analysing Level (C4)
C430-5.5	Generate error correcting codes for error detection and correction.	Analysing Level (C4)

Module No.	**title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Review of Basic Probability	Probability spaces. Random variables. Distributions and densities. Functions of random variables. Statistical Averages. Inequalities of Markov and Chebyshev. Weak law of large numbers.	3
2.	Information Measure	Discrete entropy. Joint and conditional entropies. Entropy in the continuous case. Maximization of continuous entropy. Entropy of a bandlimited white Gaussian process.	5
3.	Data Compression	Uniquely decipherable and instantaneous codes. Kraft- McMillan inequality. Noiseless coding theorem. Construction of optimal codes.	4
4.	Data Transmission	Discrete memoryless channel. Mutual information and channel capacity. Shannon's fundamental theorem and its weak converse. Capacity of a bandlimited AWGN channel. Limits to communication – Shannon limit.	5
5.	Error Control Coding	Coding for reliable digital transmission and storage. Types of codes. Modulation and coding. ML decoding. Performance measures.	3
6.	Linear Block Codes	Algebra Background, Groups, Fields, Binary field arithmetic. Vector Spaces over GF(2). Generator and parity check matrices. Syndrome and error detection. Standard array and	8

		syndrome decoding. Hamming codes.	
7.	Cyclic Codes	Polynomial representation, Systematic encoding. Cyclic encoding, Syndrome decoding.	6
8.	Convolutional Codes	Generator Sequences. Structural properties. Convolutional encoders. Optimal decoding of convolutional codes- the Viterbi algorithm.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance, Performance. Assignment/Quiz)
Total	**100**

Project Based Learning: Students will learn about the design and implementation of compression algorithms as well as error-correcting codes with the help of assignments. Using MATLAB the above concepts can be utilized for project too.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R.B. ASH: Information Theory, Dover, 1990.
2.	R. BOSE: Information theory, coding and cryptography, Mcgraw Hill 2016.
3.	R.W. YEUNG: Information Theory and Network Coding, Springer, 2010.
4.	S. LIN & D.J. COSTELLO: Error Control Coding, 2nd Edn, Pearson, 2011.
5.	T.K. MOON: Error Correction Coding, Wiley, 2006.

Detailed Syllabus
Lab-wise Breakup

Course Code	**18B15EC313**	**Semester: Odd**	**Semester: Vth Session** 2020 **Month from: July-December**
Course Name	**Embedded Systems and IOT Lab**		
Credits	1	**Contact Hours**	2 per week

Faculty (Names)	**Coordinator(s)**	Dr. Gaurav Verma
	Teacher(s) (Alphabetically)	Mr. Abhay Kumar

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	**Recall** the basic of digital electronics and relate its use in microprocessors and microcontrollers.	Remembering (Level I)
CO2	**Relate** the architecture of Microprocessors and Microcontrollers and its requirements in the area of embedded system and IOT with the help of algorithm.	Understanding (Level II)
CO3	**Apply** the skills and proficiency in the programming to demonstrate the use of instructions in microprocessors, microcontrollers and IOT Devices.	Applying (Level III)
CO4	**Analyze** the use of assemblers, cross compilers and real time hardware to program the microprocessors, microcontrollers, IOT boards and achieve the real time solutions to the problem.	Analyzing (Level IV)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1. MS, RA	8085 Microprocessors	To perform addition and subtraction of two 8-bit numbers using 8085 microprocessor.	1,2,3
2. MS, RA	8085 Microprocessors	To perform multiplication & division of two 8-bit numbers using 8085 microprocessor.	1,2,3
3.	8085 Microprocessors	To find out the smallest & largest number in an array of 'N' 8-bit numbers using 8085 microprocessor.	1,2,3
4. RS	8051 Microcontrollers	Familiarization with 8051 Software Tools through examples of: a. LED Blinking. b. Varying square wave generation on any pin (with and without timers).	2,4
5. RS	8051 Microcontrollers	Design a token display system that has a seven segment display and switches. Whenever any switch is pressed the corresponding number is displayed on the segment.	3,4
6. GV	8051 Microcontrollers	Design a traffic light controller system that has three LEDs – RED, YELLOW, GREEN. The sequence in which the LEDs are turned on is as follows: RED for 10 count, YELLOW for 5 count, GREEN for 10 count. Interface a light-dependent resistor (LDR) to select manual and automatic mode using interrupt.	3,4
7. GV	8051 Microcontrollers	Display a) JIIT on LCD b) Sum of two 8 bit numbers on LCD.	3,4
8.	8051 Microcontrollers	Establish the serial communication between PC and microcontroller using RS232 protocol to send and receive the data.	3,4
9.	8051	Interface a DC motor and two IR sensors with the	3,4

	Microcontrollers	microcontroller. The IR sensors are used to control the direction of rotation of the motor.	
10. ABY, Alok	Microcontrollers	Design an IOT based system to sense the humidity and temperature using DHT11 sensor and send it to cloud.	3,4
11. ABY, Alok	Microcontrollers	Design an IOT based system using microcontroller for controlling of home appliances using or ESP8266.	3,4
12.	Microcontrollers	Design a RFID based attendance system using LCD and microcontroller.	3,4
13.	Microcontrollers	Controlling of different household devices using an Android based application through bluetooth communication and microcontroller.	3,4
14.	Microcontrollers	Design a DTMF based wireless system using microcontroller for controlling of home appliances.	3,4

Evaluation Criteria

Components	**Maximum Marks**
Viva 1(Mid Sem Viva)	20
Viva 2(End Sem Viva)	20
Assessment Components	20
Attendance	15
Lab Record	15
Virtual Lab Exps.	10
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Manish k. Patel, "The 8051 Microcontroller Based Embedded Systems", 1st Edition, McGraw Hill Education, 2014.
2.	Divyah Bala, ESP8266: Step by Step Tutorial for ESP8266 IOT, Arduino Nodemcu Dev Kit, 2018.

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15EC314	**Semester** Odd **(specify Odd/Even)**	**Semester** 5th **Session** 2020 -2021 **Month from** Aug- Dec
Course Name	Python for Signal processing and Communication		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	B. Suresh, Neetu Singh
	Teacher(s) (Alphabetically)	B. Suresh, Kapil Dev Tyagi, Neetu Singh, Nisha Venkatesh, Parul Arora, Pankaj Kumar Yadav, Vivek Dwivedi

COURSE OUTCOMES: At the completion of the course, students will be able to:		**COGNITIVE LEVELS**
C310.1	Understand applications of Python in signal processing and communication.	Understanding Level (C2)
C310.2	Apply Python for implementing signal operations and transformations on 1-D signals.	Applying Level (C3)
C310.3	Apply Python for implementing signal operations and transformations on images.	Applying Level (C3)
C310.4	Analyze the different blocks of communication systems using Python.	Analyzing Level (C4)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Introduction to Python	Introduction to Python and its various applications.	C310.1
2.	CT Signals	Generating Continuous time signals.	C310.1
3.	DT Signals	Generating Discrete time signals.	C310.1
4.	Signal Operations	Writing codes for generating various signal operations.	C310.2
5.	DT Convolution	To calculate the convolution sum of two discrete time signals.	C310.2
6.	CT Convolution	To calculate the convolution integral of two continuous - time signals.	C310.2
7.	Signal Transformations	Writing codes to compute DFT (Discrete Fourier Transform) and IDFT (Inverse Discrete Fourier Transform) for the spectral analysis of signals.	C310.2
8.	Image Data	To read, write, display and explore image data.	C310.3
9.	Image Enhancement	To perform image enhancement in spatial domain.	C310.3
10.	Image Arithmetic	To perform arithmetic operations on the images.	C310.3
11.	Image Geometric Transformations	To apply geometric transformations to the images.	C310.3
12.	Sampling	Analysis of sampling techniques.	C310.4
13.	Pulse Code Modulation	To perform pulse code modulation and demodulation.	C310.4

14.	Digital Modulation Techniques	Analysis of digital modulation techniques.	C310.4
15.	Error Control Coding	Analysis of effect of various Data Encoding and Decoding Techniques on BER of digital communication systems.	C310.4

Evaluation Criteria

Components	**Maximum Marks**
Viva 1(Mid Sem Viva)	20
Viva 2(End Sem Viva)	20
Assessment Components	30
Attendance	15
Lab Record	15
Total	**100**

Project based learning: Students in group sizes of two-three will realize any one application of machine learning using Python programming.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	J. UNPINGCO: Python for Signal Processing, Springer International Publishing Switzerland, 2014.
2.	M. WICKERT: Signal Processing and Communications: Teaching and Research Using IPython Notebook, In Proc. of the 14th python in science conf., (scipy. 2015).
3.	B. P. LATHI: Modern Digital and Analog Communication System: Python textbook Companion, Oxford University Press Inc.

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**15B19EC591**	**Semester** **Odd**	**Semester 5**th **Session** 2020-21 **Month from** Aug 20 to Dec 20
Subject Name	**Minor Project - 1**		
Credits	**2**	**Contact Hours**	**NA**

Faculty (Names)	**Coordinator(s)**	Neetu Singh, Raghvenda Kumar Singh
	Teacher(s) (Alphabetically)	NA

COURSE OUTCOMES		**COGNITIVE LEVELS**
C350.1	Identifying, planning and initiation of the individual projects in the domain selected by them, respectively.	Applying Level (C3)
C350.2	Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.	Analysing Level (C4)
C350.3	Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study.	Analysing Level (C4)
C350.4	Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics.	Evaluating Level (C5)
C350.5	Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.	Creating Level (C6)

Evaluation Criteria

Components	**Maximum Marks**
Mid Semester Evaluation	40
Final Evaluation	40
Report	20
Total	**100**

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B1NHS434	**Semester:** Odd	**Semester** V **Session** 2020 -2021 **Month from** Aug 2020 to Dec 2020
Course Name	Principles of Management		
Credits	**3**	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Deepak Verma (deepak.verma@jiit.ac.in)
	Teacher(s) (Alphabetically)	Dr. Deepak Verma

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-1.1	Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving.	Understanding Level (C2)
C303-1.2	Examine the relevance of the political, legal, ethical, economic and cultural environments in global business.	Analyzing Level (C4)
C303-1.3	Evaluate approaches to goal setting, planning and organizing in a variety of circumstances.	Evaluating Level (C5)
C303-1.4	Evaluate contemporary approaches for staffing and leading in an organization.	Evaluating Level (C5)
C303-1.5	Analyze contemporary issues in controlling for measuring organizational performance.	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Managers and Management	Management an Overview: Introduction, Definition of Management, Role of Management, Functions of Managers, Levels of Management, Management Skills and Organizational Hierarchy, Social and Ethical Responsibilities of Management: Arguments for and against Social Responsibilities of Business, Social Stakeholders, Measuring Social Responsiveness and Managerial Ethics, Omnipotent and Symbolic View, Characteristics and importance of organizational culture, Relevance of political, legal, economic and Cultural environments to global business, Structures and techniques organizations use as they go international.	10
2.	Planning	Nature & Purpose, Steps involved in Planning, Objectives, Setting Objectives, Process of Managing by Objectives, Strategies, Policies & Planning Premises, Competitor Intelligence, Benchmarking, Forecasting, Decision-Making.	8
3.	Organizing	Nature and Purpose, Formal and Informal Organization, Organization Chart, Structure and Process, Departmentalization by difference strategies, Line and Staff authority- Benefits and Limitations-De-Centralization and Delegation of Authority Versus, Staffing, Managerial Effectiveness.	10
4.	Directing	Scope, Human Factors, Creativity and Innovation, Harmonizing Objectives, Leadership, Types of Leadership Motivation, Hierarchy of Needs, Motivation theories,	6

		Motivational Techniques, Job Enrichment, Communication, Process of Communication, Barriers and Breakdown, Effective Communication, Electronic media in Communication.	
5.	Controlling	System and process of Controlling, Requirements for effective control, The Budget as Control Technique, Information Technology in Controlling, Productivity, Problems and Management, Control of Overall Performance, Direct and Preventive Control, Reporting, The Global Environment, Globalization and Liberalization, International Management and Global theory of Management.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Quiz, Attendance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Koontz H, Weihrich H. Essentials of management: an international, innovation, and leadership perspective. McGraw-Hill Education; 10th Edition 2018.
2.	Tripathi PC. Principles of management. Tata McGraw-Hill Education; 6th Edition 2017.
3.	Principles of Management Text and Cases, Pravin Durai , Pearson ,2015
4.	Robbins, S.P. & Decenzo, David A. Fundamentals of Management,7th ed., Pearson, 2010
5.	Robbins, S.P. & Coulter, Mary Management; 14 ed.,Pearson , 2009

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI518	**Semester -** ODD	**Semester** V **Session** 2020 -2021 **Month from** July '20 to Dec '20
Course Name	Data Structures & Algorithms		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Manju, Ms. Shardha Porwal, Dr Himani Bansal(128)
	Teacher(s) (Alphabetically)	Avinash, Himani Bansal, Manju, Potukuchi Raghu Vamsi, Shardha Porwal, Sherry Garg

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Apply fundamental operations on data structures such as linked-lists, trees, binary search trees, AVL trees, heap trees, graphs, and hash-tables.	Apply Level (Level 3)
CO2	Analyze and compare different sorting algorithms - Merge Sort, Quick sort, Shell sort and Bucket Sort.	Analyze Level (Level 4)
CO3	Identify suitable data structure and develop solution for the given problem.	Apply Level (Level 3)
CO4	Formulate solutions for programming problems or improve existing code using algorithms such as, Backtracking, Branch and Bound, Greedy algorithm and Dynamic programming.	Apply Level (Level 3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to data structures, lists, Doubly linked list, circular linked list, multi linked list, Applications - sparse matrix representation, Stack and queue (array and linked list representation)	8
2.	Algorithm Complexity	Abstract data type, Growth of function, Space-Time tradeoffs, Complexity analysis of algorithms - Asymptotic analysis	2
3.	Sorting & Searching	Merge Sort, Quick sort, Shell sort, Bucket Sort, Median search, Interpolation search	6
4.	Trees	Binary Tree, Binary Search tree, AVL Tree, B Tree, B+ Tree	7
5.	Heaps	Introduction to heaps, Binary heap	2
6.	Graph	Introduction to graphs, Representation – adjacency list, adjacency matrix, Traversal – BFS, DFS, Minimum spanning tree – Prims and Kruskal's algorithm,	4
7.	Hashing	Introduction to hashing, Collision resolution – open and closed hashing methods	3

8.	Algorithm	Introduction to Backtracking Algorithm, Branch and Bound, Greedy algorithm, Problems on Greedy algorithm (0-1 Knapsack), Dynamic programming, Problems on Dynamic Programming (Fractional Knapsack, Longest Common Subsequence) Graph Algorithms- Shortest path using Dijkstra algorithm and Floyd–Warshall algorithm	10
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance = 07, Class Test/Quiz= 07, Internal assessment = 05 Assignments in PBL mode = 06)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc.

Text Books

1.	Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning; 4th edition (2012)
2.	Data Structures and Algorithms Made Easy, by Narasimha Karumanchi, CareerMonk Publications; 5th edition (2016)
3.	An Introduction to Data Structures with Application, by Jean-Paul Tremblay , Paul Sorenson, McGraw Hill Education; 2 edition (2017)

References

1.	Yedidyah Langsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2nd Edition, PHI, 2001
2.	Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984
3.	Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004
4.	Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson
5.	Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005
6.	Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002
7.	Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003
8.	Cormen et al: Introduction to Computer Algorithms, 2nd edition , PHI New Delhi 2003
9.	Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001
10.	Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000
11.	Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition , Pearson Education Asia (Adisson Wesley), New Delhi, 2002

Department of Computer Science and Engineering & Information Technology,
JIIT, Noida

Detailed Syllabus

Subject Code	15B17CI578	**Semester:** ODD/ Special Sem	**Semester:** 5th **Session:** 2020-2021 **Month from:** Jun'21
Subject Name	Data Structures & Algorithms Lab		
Credits	0-0-1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Sarishty Gupta (62) , Akanksha Mehndiratta (128)
	Teacher(s) (Alphabetically)	Anita Sahoo, Krishna Asawa, Shardha Porwal, Shikha Jain, Sulabh Tyagi, Tribhuwan Tewari

COURSE OUTCOMES		**COGNITIVE LEVELS**
C371.1	Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications.	Understanding Level (C2)
C371.2	Interpret the complexity of algorithms for given problems.	Understanding Level (C2)
C371.3	Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities.	Apply Level (C3)
C371.4	Examine case-study specific application of Heaps, Graphs, and Hashing methods.	Apply Level (C3)
C371.5	Model algorithmic solutions for small real-life problems using Backtracking, Greedy algorithm and Dynamic programming, Branch and Bound, and others	Apply Level (C3)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Introduction & Algorithm Complexity	Conversion from one number system to another; Manipulation with arrays and strings, structures; Manipulation with a	CO1, CO2, Understanding Level (C2)

		single Linked list of integers; Stacks and Queues Finding Complexity: Big O, Big Omega Cost Analysis	
2.	Sorting, Searching & Trees	Doubly Linked List, Circular Linked List Multi-Linked Lists; Sorting, Searching, Application based. Binary Tree, Binary Search Trees, AVL Tree, Case-study: Priority Queue with Binary Trees, B Trees	CO1 Understanding Level(C2) CO3 Apply Level (C3)
3.	Heaps, Graph	Heaps, Directed and undirected graphs, weighted graphs, etc.	CO4 Apply Level (C3)
4.	Hashing & other Algorithms	Hashing, Backtracking, Branch and Bound, Greedy Algorithms, Dynamic Programming.	CO5 Apply Level (C3)

Evaluation Criteria

Components	**Maximum Marks**
Lab Test 1	20
Lab Test 2	20
Quiz 1	15
Quiz 2	15
Day-to-DayAssignments	15
Attendance	15
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Books

1	Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning; 4th edition (2012)
2	Data Structures and Algorithms Made Easy, by Narasimha Karumanchi, CareerMonk Publications; 5th edition (2016)
3	An Introduction to Data Structures with Application, by Jean-Paul Tremblay , Paul Sorenson, McGraw Hill Education; 2 edition (2017)

References

4	YedidyahLangsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2nd Edition, PHI, 2001

5	Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984
6	Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004
7	Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson
8	Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005
9	Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002
10	Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003
11	Cormen et al: Introduction to Computer Algorithms, 2nd edition , PHI New Delhi 2003
12	Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001
13	Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000
14	Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition ,Pearson Education Asia (Adisson Wesley), New Delhi, 2002
15	Heileman: Data Structures, Algorithms and Object Oriented Programming, Tata Mc-Graw Hill, New Delhi, 2002
16	Sorenson and Tremblay: An Introduction to Data Structures with Algorithms, 2nd Edition, Tata Mc-Graw Hill, New Delhi, 2003

Detailed Syllabus
Lecture-wise Breakup

Course Code	**16B1NHS433**	**Semester: Odd**	**Semester:** 5th Sem **Session** 2020-2021 **Month from August to Dec 2020**
Course Name	Financial Management		
Credits	3	**Contact Hours**	3 (3-0-0)

Faculty (Names)	**Coordinator(s)**	Dr. Mukta Mani (Sec-62) Dr. SakshiVarshney (Sec-128)
	Teacher(s) (Alphabetically)	Dr. Mukta Mani (Sec-62) Dr. SakshiVarshney (Sec-128) Dr. ShirinAlavi (Sec-62)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-3.1	Analyze the time value of money in taking investment decisions.	Analyze (Level 4)
C303-3.2	Contrast the various forms of business organizations and evaluate their financialperformance.	Evaluate (Level5)
C303-3.3	Evaluate investment projects using capital budgeting techniques	Evaluate (Level5)
C303-3.4	Apply the concept of cost of capital into evaluation of investment projects	Apply (Level 3)
C303-3.5	Evaluate the leverage capacity of a business and its application in selection of long term sources of finance.	Evaluate (Level5)
C303-3.6	Understand the practical considerations for managing working capital requirement in a firm.	Understand (Level 2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Basic financial concepts-Meaning of Accounting, Accounting Concepts and Conventions, Introduction to Double Entry system and Accounting equation, Definitionand Objectives of Financial management, Finance functions and Role of Finance manager	4
2.	Time value of Money	Compounding, Discounting, Annuity, Perpetuity, Loan Amortization	6
3.	Analysis of Financial Statements	Understanding of Balance Sheet and Income Statements, Ratio Analysis, Interpretation, Importance and limitations	7
4.	Capital Budgeting: Principle Techniques	Nature of Capital Budgeting, Evaluation Techniques: Discounting (NPV, IRR etc.) and Non-discounting Techniques (payback, ARR etc)	5
5.	Long Term Sources of Finance	Definition, types, advantages and disadvantages	3
6.	Concept and measurement of cost of capital	Definition, measurement of specific costs, computation of Overall Cost of Capital,	4
7.	Cash Flows for Capital Budgeting	Identification and determination of relevant cash flows	5

8.	Leverages and Capital structure decision and Working Capital Management	Break Even Analysis, Operating, Financial and combined leverage, Capital structure EBIT- EPS analysis, Concept ofworkingcapitalmanagement,PracticalConsiderations in Working capital management	5
9.	Project presentations		3
		Total	42

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Term	35
TA	25 (Project, Class Participation)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Khan, M.Y. and Jain, P.K., *Financial Management: Text, Problems and Cases*, 5th ed, Tata McGraw Hill, 2007.
2.	Chandra, P., *Financial Management Theory and Practice*, 6th ed., Tata McGraw Hill, 2004.
3.	Pandey, I.M., *Financial management*, 9th ed, Vikas Publishing House Pvt Ltd, 2006
4.	Van Horne, J.C. and Wachowicz, J.M., *Fundamentals of Financial Management*, 11th ed, Pearson Education, 2001
5.	Kishore, R.M., *Financial Management*, 6th ed, Taxmann, 2007.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	**16B1NHS435**	**Semester : ODD**	**Semester: V Session: 2020-21** **Month: August to December**
Subject Name	**SOCIOLOGY OF MEDIA**		
Credits	**3 (2-1-0)**	**Contact Hours**	**42**

Faculty (Names)	**Coordinator(s)**	**Prof. Alka Sharma**
	Teacher(s) (Alphabetically)	**Prof. Alka Sharma**

COURSE OUTCOMES		**COGNITIVE LEVELS**
C304-1.1	Demonstrate a basic understanding of different concepts used in the systematic study of Sociology of Media	Understanding(C 2)
C304-1.2	Examine various sociological theoretical orientation towards media and society.	Analyzing(C 4)
C304-1.3	Analyze the key issues related to the processes of Production of Media, Popular Culture and consumer culture.	Analyzing(C 4)
C304-1.4	Critically evaluate the major methods of Cultural Consumption ,Social Class & the process of construction of subjectivities and audience reception in new Media	Evaluating(C 5)
C304-1.5	Create positive and critical attitude towards the use of new media and understanding of threats of Digital Age	Creating(C 6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introduction to the Course	1
2.	Concepts and Theoretical Orientation of Sociology of Media	• Different concepts related to Sociology of media • Functionalist Approach to the Sociology of Media • Critical Approach to the Sociology of Media • Symbolic Interactionist Approach to the Sociology of Media • Different theories of Media	8
3.	Concept of Popular Culture and its critical analysis	• What is popular culture? • Difference between 'pop' culture and 'high' culture • What distinguishes popular culture from other kinds of culture (art, folk culture)? Is there a distinction at all anymore? • Visualizing Society through 'pop' culture/ media • Risks and rituals that come with Popular Culture	8
4.	New media	• Difference between tradition media and new media • New media as technology • New Information Technology (brief history in case of India)	5

5.	Media & State	• Mediatization of Society • Free-speech Media	5
6.	Consumption of Media and Media reception	• Social Actors as Audience/ Audience as market– Theory • Media effects: Media and representations (gender, ethnic)- the under-representation and misrepresentation of subordinate groups. • Media and the construction of reality: media logic and cultivation analysis theory • Information Society vs Informed Society • Cultural Consumption and Social Class	9
7.	Media in Global Age	• Rise of Network Society- Manuel Castells • Global Media: impact of market & state • Global Perspectives: The world on our doorstep • Marketing and aesthetics in everyday life	6
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Presentation and attendance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Ritzer, George, and Steven Miles. "*The changing nature of consumption and the intensification of McDonaldization in the digital age."* Journal of Consumer Culture 19, no. 1, pp 3-20, 2019.
2.	Turow, Joseph. *Media today: An introduction to mass communication*. Taylor & Francis, 2011.
3.	Curran, James. *Media and society*. Bloomsbury Publishing, 2010.
4	JA Fisher 'High Art v/s Low Art, in Berys Nigel Gaut & Dominic Lopes (eds.), *The Routledge Companion to Aesthetics*. Routledge 2001

DETAILED SYLLABUS
Lecture-wise Breakup

Course Code	16B1NHS532	**Semester: ODD (specify Odd/Even)**	**Semester: 5th Month from: Aug to Dec2020**
Course Name	Planning and Economic Development		
Credits	03	Contact Hours	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Akarsh Arora
	Teacher(s) (Alphabetically)	1. Dr. Akarsh Arora (akarsh.arora@mail.jiit.ac.in) 2. Dr. Amandeep Kaur (amandeep.kaur@mail.jiit.ac.in)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-4.1	Understand the issues and approaches to economic development.	C2
C303-4.2	Evaluate National income accounting, human development index and sustainable development.	C5
C303-4.3	Apply an analytical framework to understand the structural characteristics of development.	C3
C303-4.4	Analyze the role of Macroeconomic stability & policies and Inflation in the development process.	C4
C303-4.5	Evaluate the importance of federal development and decentralization.	C5

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Economic Development and its Determinants	Economic growth and development. Indicators of development. Approaches to economic development. Rostows Stages of Growth.	5
2.	National Income Accounting	National Income Accounting, Green GNP and Sustainable development	5
3.	Indicators of development	PQLI, Human Development Index (HDI) and gender development indices.	4
4.	Demographic Features, Poverty and Inequality	Demographic features of Indian population; Rural-urban migration; Growth of Primary, Secondary and Tertiary Sector.	5
5.	Inflation and Business Cycles	Inflation. Business cycle. Multiplier and Accelerator Interaction.	6
6.	Macro-Economic Stability & Policies	Monetary Policy. Fiscal Policy. Role of Central Bank & Commercial banks in the development of the country. Balance of payments; currency convertibility and Issues in export-import policy.	6
7.	Federal Development	The Federal Set-up - The Financial Issues in a Federal Set-up, Principles for Efficient Division of	6

		Financial Resources between Governments. Financial Federalism under Constitution. Finance Commissions in India, Terms of References and its Recommendations	
8.	Planning and Development	Need for planning, Decentralisation, Rural and Urban local bodies.	5
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment + Quiz)
Total	**100**

Recommended Reading material:

1. **Todaro, M.P**., **Stephen C. Smith,** Economic Development, Pearson Education, 2017
2. **Thirwal, A.P**., Economics of Development, Palgrave, 2011
3. **Ahuja, H. L.**, Development Economics, S Chand publishing, 2016
4. **Ray, Debraj,** Development Economics, Oxford University Press, 2016

Detailed Syllabus
Lecture-wise Breakup

Subject Code	19B12HS311	**Semester: ODD**	**Semester V Session 2020-21** **Month from Aug 2020 to Dec 2020**
Subject Name	**ENTREPRENEURIAL DEVELOPMENT**		
Credits	**3**	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	**Dr Badri Bajaj**
	Teacher(s) (Alphabetically)	**Dr Badri Bajaj**

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-8.1	Understand basic aspects of establishing a business in a competitive environment	Understand Level (C2)
C303-8.2	Apply the basic understanding to examine the existing business ventures	Apply Level (C3)
C303-8.3	Examine various business considerations such as marketing, financial and teaming etc.	Analyze Level (C4)
C303-8.4	Assessing strategies for planning a business venture	Evaluate Level (C5)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Entrepreneurial perspective	Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur Types of entrepreneurs	6
2.	Beginning Considerations	Creativity and developing business ideas; Legal issues; Creating and starting the venture; Building a competitive advantage	10
3.	Developing Marketing Plans	Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications	8
4.	Developing Financial Plans	Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan Developing a business plan	10
5.	Leading Considerations	Developing Team, Leading the growing company, Resources for growth	8
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Quiz , Oral Questions)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship" 10th Edition, McGraw Hill Education, 2018
2.	Norman M. Scarborough and Jeffery R. cornwell, "Essentials of entrepreneurship and small business management" 8th Edition, Pearson, 2016
3.	Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011
4.	Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH531	**Semester : ODD**	**Semester: 5th Session:** 2020 -2021 **Month from July to December**
Course Name	**Quantum Mechanics for Engineers**		
Credits	3	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Anuraj Panwar
	Teacher(s) (Alphabetically)	Anuraj Panwar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-10.1	Remember basics of Quantum Mechanics and its applications.	Remembering (C1)
C301-10.2	Explain postulates of quantum mechanics, Dirac notation, Schrödinger Equation, Perturbation theory and Qubits.	Understanding (C2)
C301-10.3	Solve various problems related to different quantum systems and construct quantum circuits using quantum gates.	Applying (C3)
C301-10.4	Analyse the results obtained for various physical systems and to establish the advantages of some simple protocols of quantum information processing.	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Wave particle duality, quantum physics (Planck and Einstein's ideas of quantized light), postulates of quantum mechanics, time dependent and time independent Schrodinger equation, operators, probability theory, expectation values, and uncertainty principle and its implications, no cloning applications	8
2.	Measurement Theory with Applications	Matrix and linear algebra, Eigen values and eigenfunctions Hilbert space, Kets, Bras and Operators, Bras Kets and Matrix representations, Measurements, Stern Gerlach Experiment, Observables and Uncertainity Relations, No-cloning theorem, Pauli Spin Matrices.	10
3.	Potential problems	1-D, 2-D, and 3-D potential problems (including infinite and finite square well). Tunneling, harmonic oscillator, separation in spherical polar coordinates, hydrogen atom, etc.),	08
4.	Approximation methods	Time independent perturbation theory for nondegenerate and degenerate energy levels.	4
5.	Advanced Applications	Kronig Penny model, Basic ideas of quantum computing, Qubit, Gate model of quantum computing : H, CNOT, Pauli Gates, BB84 protocol, Advantages of quantum computing, Quantum wire, Quantum dot and realization of CNOT using Quantum dot.	10
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**

T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	The new quantum universe by Toney Hey and Patrick Walters, Cambridge University Press.
2.	Quantum mechanics a new introduction by Kenichi Konishi and G Paffuti, OUP., 2009
3.	Quantum physics by Eyvind H Wichman (Berley Physics course Vol 4) Tata McGraw Hill 2008
4.	Elements of quantum computation and quantum communication by A Pathak, CRC Press 2013.
5.	Introduction to Quantum Mechanics by David J. Griffiths, Second Edition, Pearson, 2015.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH532	**Semester**: ODD	**Semester: 5th Session:** 2020 -2021 **Month from July to December**
Course Name	Materials Science		
Credits	3	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Manoj Kumar and Sandeep Chhoker
	Teacher(s) (Alphabetically)	Manoj Kumar and Sandeep Chhoker

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-11.1	Recall variety of engineering materials for their applications in contemporary devices	Remembering (C1)
C301-11.2	Explain dielectric, optical, magnetic, superconducting, polymer and thermoelectric properties	Understanding (C2)
C301-11.3	Apply properties of dielectric, optical, magnetic, superconducting, polymer and thermoelectric materials to solve related problems	Applying (C3)
C301-11.5	Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various materials	Evaluating (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Dielectric Materials	Polarization mechanism & Dielectric Constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Spontaneous polarization, Ferroelectrics, Piezoelectric effect; Applications of Dielectric Materials	10
2.	Magnetic Materials	Concept of magnetism, Classification – dia-, para-, ferro-, antiferro- and ferri-magnetic materials, Their properties and Applications; Hysteresis; Magnetic Storage and Surfaces.	**10**
3.	Super conducting Materials	Meissner effect, Critical field, type-I and type-II superconductors; Field penetration and London equation; BCS Theory, High temperature Superconductors and their Applications	**5**
4.	Polymers and Ceramics	Various types of Polymers and their applications; Mechanical behavior of Polymers, synthesis of polymers; Structure, Types, Properties and Applications of Ceramics; Mechanical behavior and Processing of Ceramics.	**6**
5.	Optical Materials	Basic Concepts, Light interactions with solids, Optical properties of nonmetals: refraction, reflection, absorption, Beer-Lambert law, transmission, Photoconductivity. Drude Model, relation between refractive index and relative dielectric constant, Optical absorption in metals, insulators and semiconductors. Introduction to Photonic band gap (PBG) materials and its applications	**6**

6.	Thermoelectric Materials	Thermoelectric (TE) effects and coefficients (Seebeck, Peltier, Thompson); TE materials and devices, Heat conduction, Cooling, Figure of Merit; TE power generation (efficiency), refrigeration (COP), Examples and applications.	**3**
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10), Attend. (10) and Class performance (5)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	S.O. Pillai, Solid State Physics, New Age International Publishers.
2.	B. B. Laud, Laser and Non-linear Optics, John Wiley & Sons
3.	Van Vlack, Elements of Material Science and Engineering, Pearson Education.
4.	Srivastava and Srinivasan, Material Science and Engineering,
5	W.D. Callister Jr., Material Science and Engineering: An Introduction, John Wiley.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH533	**Semester: ODD**	**Semester: 5th Session:** 2020 -2021 **Month from July to December**
Course Name	Laser Technology and Applications		
Credits	3	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Navneet Kumar Sharma and Anshu Varshney
	Teacher(s) (Alphabetically)	Navneet Kumar Sharma and Anshu Varshney

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-12.1	Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology	Remember Level (C1)
C301-12.2	Extend the knowledge of lasers in some applications like LIDAR, laser tracking, bar code scanner, lasers in medicine and lasers in industry	Understand Level (C2)
C301-12.3	Apply the optical ray transfer matrix to determine the stability of a laser resonator	Apply Level (C3)
C301-12.4	Distinguish the operational principles of CW, Q-switched, mode locked lasers; laser rate equations for three & four level lasers; different types of laser systems	Analyze Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Fundamentals of Lasers	Laser idea and properties; Monochromaticity, directionality, brightness, Temporal and spatial Coherence. Interaction of radiation with matter; Absorption, spontaneous and stimulated emission of radiation, Rates equations, Einstein's A and B coefficients. Laser rate equations: Four level and three level systems. Conditions for producing laser action, population inversion, saturation intensity, threshold condition and gain optimization. Experimental techniques to characterize laser beam.	12
2.	Types of Lasers	Pumping processes; optical and electrical pumping. Optical Resonators; The quality factor, transverse and longitudinal mode selection; Q switching and Mode locking in lasers. Confocal, planar and spherical resonator systems. Types of Lasers; Solid state Lasers; Ruby Laser, Nd:YAG laser. Gas lasers; He-Ne laser, Argon laser, CO_2, N_2 and Excimer Laser. Dye (liquid) Laser, Chemical laser (HF), Semiconductor Lasers; Heterostructure Lasers, Quantum well Lasers. Free electron laser, X-ray laser and Ultrafast Laser.	16
3.	Applications of Lasers	Image processing; Spatial frequency filtering and Holography, Laser induced fusion; Fusion reactor, creation of Plasma. Lightwave communications. Use in optical reader (CD player) and writer. Nonlinear optics; harmonic generation, self focusing. Lasers in industry; Material processing, Cutting, welding and whole drilling. Precision	12

		length measurement, velocity measurement, Laser Tracking, Metrology and LIDAR. Lasers in medicines and surgery. Lasers in defense, Lasers in space sciences, Lasers in sensors.	
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Thyagarajan and Ghatak, *Lasers Theory and Applications*, Macmilan India.
2.	W. T. Silfvast, *Laser Fundmentals*, Cambridge Univ-Press.
3.	O. Svelto, *Principles of Lasers*, Springer.
4.	Saleh and Teich, *Fundamentals of Photonics*, John Wiley & Sons.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH535	**Semester: ODD**	**Semester: 5th Session:** 2020 -2021 **Month from July 20 to December 20**
Course Name	NUCLEAR SCIENCE AND ENGINEERING		
Credits	3	**Contact Hours**	3+1

Faculty (Names)	**Coordinator(s)**	Manoj Tripathi
	Teacher(s) (Alphabetically)	Manoj Tripathi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-14.1	Relate terminology and concepts of nuclear science with various natural phenomenon and engineering applications.	Remembering (C1)
C301-14.2	Explain various nuclear phenomenon, nuclear models, mass spectrometers, nuclear detectors, particle accelerators. and classify elementary particles.	Understanding (C2)
C301-14.3	Solve mathematical problems for various nuclear phenomenon and nuclear devices.	Applying (C3)
C301-14.4	Analyze the results obtained for various physical problems and draw inferences from the results.	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Nuclear Constituents and their properties, Nuclear Forces	Rutherford scattering and estimation of nuclear size, Constituents of the nucleus and their properties, Nuclear Spin, Moments and statistics, Magnetic dipole moment, Electric quadruple moment. Nuclear forces, Two body problem - Ground state of deuteron, Central and non-central forces, Exchange forces: Meson theory, Yukawa potential, Nucleon-nucleon scattering, Low energy n-p scattering, Effective range theory, Spin dependence, charge independence and charge symmetry of nuclear forces, Isospin formalism.	07
2.	Nuclear Models	Binding energies of nuclei, Liquid drop model: Semi-empirical mass formula, Mass parabolas, Prediction of Nuclear stability, Bohr-Wheeler theory of fission, Shell model, Spin-orbit coupling. Magic numbers, Angular momenta and parities of nuclear ground state, Magnetic moments and Schmidt lines, Collective model of a nucleus.	05
3.	Nuclear decay and Nuclear reactions	Alpha decay, Beta decay, Pauli's Neutrino hypothesis-Helicity of neutrino, Theory of electron capture, Non-conservation of parity, Fermi's theory, Gamma decay: Internal conversion, Multipole transitions in nuclei, Nuclear isomerism, Artificial radioactivity, Nuclear reactions and conservation laws, Q-value equation, Centre of mass frame in nuclear Physics, Scattering and reaction cross sections, compound nucleus, Breit-Wigner one level formula	08

4.	Interaction of nuclear radiation with matter	Interaction of charge particles with matters: Bohr's ionization loss formula and estimation of charge, mass and energy. Interaction of electromagnetic radiation with matter, Linear absorption coefficient. Nuclear particle detectors and neutron counters.	07
5.	Accelerator and reactor Physics	Different types of reactors, tracer techniques, activation analysis. Radiation induced effects and their applications: Accelerators: Linear accelerators, Van de Graff generator, LINAC, Cyclotrons, Synchrotons, Colliders.	06
6.	Cosmic radiation and Elementary Particles	Cosmic radiation: Discovery of cosmic radiation, its sources and composition, Latitude effect, altitude effect and east-west asymmetry, secondary cosmic rays, cosmic ray shower, variation of cosmic intensity and Van Allen radiation belt. Elementary particles: Classification of particles, K-mesons, Hyperons, particles and antiparticles, fundamental interactions, conservation laws, CPT theorem, resonance particles and hypernucleus, Quark model.	07
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (7 M) and PBL & Cass performance (8 M)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	K.S. Krane, 1987, Introductory Nuclear Physics, Wiley, New York.
2.	I. Kaplan, 1989, Nuclear Physics, 2nd Edition, Narosa, New Delhi.
3.	B.L. Cohen, 1971, Concepts of Nuclear Physics, TMH, New Delhi.
4.	R.R. Roy and B.P. Nigam, 1983, Nuclear Physics, New Age International, New Delhi.
5.	H.A. Enge, 1975, Introduction to Nuclear Physics, Addison Wesle, London.
6.	Y.R. Waghmare, 1981, Introductory Nuclear Physics, Oxford-IBH, New Delhi.
7.	R.D. Evans, 1955, Atomic Nucleus, McGraw-Hill, New York.

Discrete Mathematics (16B1NMA531)

Course Description

Course Code	16B1NMA531	**Semester** Odd		**Semester** V **Session** 2020-21 **Month from** Aug 2020- Dec 2020	
Course Name	Discrete Mathematics				
Credits	3		**Contact Hours**	3-0-0	
Faculty (Names)	**Coordinator(s)**	Dr. Anuj Bhardwaj			
	Teacher(s) (Alphabetically)	Dr. Anuj Bhardwaj			

COURSE OUTCOMES: After the successful completion of this course, the student will be able to		**COGNITIVE LEVELS**
C301-1.1	explain partial order relations, Hasse diagram, lattices and recursive functions.	Understanding Level (C2)
C301-1.2	solve the difference equations using generating function and Z-transform.	Applying Level (C3)
C301-1.3	explain the propositional and predicate calculus to check the validity of arguments.	Understanding Level (C2)
C301-1.4	demonstrate graphs, digraphs, trees and use it to solve the different problems of graph theory.	Applying Level (C3)
C301-1.5	illustrate various algebraic structures and their properties.	Understanding Level (C2)
C301-1.6	explain the theory of formal languages and solve the related problems of automata.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Relations and Lattices	Relations and their composition. Pictorial representation, matrix and graphical representations. Equivalence relations and partitions. Partial ordered relations and Hasse diagram. Lattices.	5
2.	Functions	Functions and Recursively defined functions, generating functions, solution of recurrence relations by generating function. Z transforms, solution of difference equations by Z transform.	8
3.	Propositional Calculus	Propositions- simple and compound. Basic logical operators. Implication. Truth tables. Tautologies and contradictions. Valid arguments and fallacy. Propositional functions and quantifiers.	4
4.	Graphs	Graphs and related definitions, subgraphs, isomorphism, paths and connectivity. Eulerian graph and Konigsberg problem. Hamiltonian graph. Labelled and weighted graphs. Tree Graphs- Minimum spanning Tree (Prim's algorithm). Graph colorings. Four color problem.	7
5.	Directed Graphs	Trees, Digraphs and related definitions. Rooted trees. Algebraic expressions and Polish notation. Sequential	5

		representation. Adjacency matrix. Path matrix. Shortest path. Linked representation of directed graphs. Binary trees.	
6.	Algebraic Structures	Groups- definitions and examples, order of elements, subgroup, condition for subgroups. Quotient groups, Lagrange theorem and applications, Rings, integral domains and Fields- definition and examples.	7
7.	Languages and Grammars	Strings (words) and languages, grammars, types of grammars, Finite state machines, finite state automata, regular languages and regular expressions.	6
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials, PBL)
Total	**100**

Recommended Reading material:

1.	**Lipschutz, S. and Lipson**, M., Discrete Mathematics, 2nd Edition, Tata McGraw-Hill, 1997.
2.	**Rosen, K. H.,** Discrete Mathematics and its Application, 7th Edition, Tata McGraw-Hill, 2011.
3.	**Liu, C. L**., Elements of Discrete Mathematics, 2nd Edition, Tata McGraw-Hill, 1998.
4.	**Kolman, B., Busby, R. C. and Ross, S.,** Discrete Mathematical Structures, 6th Edition, Prentice Hall, 2018.
5.	**Deo, N.,** Graph Theory, Prentice Hall, 2004.
6.	**Grimaldi, R.P.,** Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2011.

Matrix Computations (16B1NMA533)

Course Description

Course Code	16B1NMA533	**Semester** - Odd	**Semester** V **Session** 2020 -2021 **Month from** Aug 2020 - Dec 2020
Course Name	Matrix Computations		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Amita Bhagat and Dr. Neha Singhal	
	Teacher(s) (Alphabetically)	Dr. Amita Bhagat, Dr. DCS Bisht, Dr. Neha Singhal, Dr. Pato Kumari	

COURSE OUTCOMES After the successful completion of this course, the student will be able to		**COGNITIVE LEVELS**
C301-3.1	explain the basics of matrix algebra and inverse of a matrix by partitioning.	Understanding level (C2)
C301-3.2	solve the system of linear equations using direct and iterative methods.	Applying Level (C3)
C301-3.3	explain the vector spaces and their dimensions, inner product space, norm of a vector and matrix.	Understanding level (C2)
C301-3.4	apply the Gram-Schmidt process to construct orthonormal basis and Q-R decomposition of a matrix.	Applying Level (C3)
C301-3.5	construct Gershgorin's circles and solve eigenvalue problem using Jacobi, Givens, Housholder, power and inverse power methods.	Applying Level (C3)
C301-3.6	analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Matrix Algebra	Review of matrices, partitioning, block diagonal matrix, elementary matrices, Inverse of a matrix by partitioning.	6
2.	Linear System of equations	Existence and uniqueness of solution for system of linear equations. Partial pivoting, LU decomposition, Crout's and Doolittle's methods, Cholesky factorization. Gauss Siedel, Gauss Jacobi iterative methods.	6
3.	Vector and Inner Product Spaces	Vector spaces, Subspaces, dimension and basis, *p*-norms of vector, Inner product, Norm using inner product and norms of a matrix.	6
4.	Orthogonality	Orthogonal and orthonormal sets, Gram-Schmidt	4

		process, QR factorization.	
5.	Eigen value Problems	Eigen values and Eigenvectors, spectral radius, Greshgorin's theorem, Jacobi method, Givens rotations method and Householder's method, Power and Inverse power methods, Q-R algorithm.	12
6.	Matrix Calculus	Powers and functions of matrices, application to solve discrete dynamical systems $x(t+1) = Ax(t)$, $x(0) = \alpha$ and a system of differential equations of the form $dx/dt = Ax$, $x(0) = \alpha$.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Quizzes and Tutorial)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	**Bronson, R**., Matrix Methods an Introduction, Academic Press, 1991.
2.	**Golub, G. H., Loan, C. F. V.,** Matrix Computations, 4th Edition, Johns Hopkins University Press, 2013.
3.	**Datta, K. B.**, Matrix and Linear Algebra, 3rd Edition, Prentice Hall of India, 2016.
4.	**David, W. Lewis**., Matrix Theory, World Scientific, 1991.

Basic Numerical Methods (17B1NMA531)

Course Description

Course Code	17B1NMA531	**Semester** - Odd		**Semester** V **Session** 2020-21 **Month from** Aug 2020- Dec 2020	
Course Name	Basic Numerical Methods				
Credits	3		**Contact Hours**	3-0-0	
Faculty (Names)	**Coordinator(s)**	Dr. Lokendra Kumar and Dr. Pankaj Kumar Srivastava			
	Teacher(s) (Alphabetically)	Dr. Lokendra Kumar, Dr. Trapti Neer, Dr. Pankaj Kumar Srivastava, Dr. DCS Bisht			

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C301-5.1	explain the concepts of approximation and errors in computation.	Understanding level (C2)
C301-5.2	construct numerical methods for algebraic and transcendental equations and their convergence.	Applying Level (C3)
C301-5.3	outline the methods of interpolation using finite differences and divided difference formulas.	Understanding level (C2)
C301-5.4	make use of numerical differentiation and integration.	Applying Level (C3)
C301-5.5	solve the system of linear equations using direct and iterative methods.	Applying Level (C3)
C301-5.6	solve ordinary differential equations using different numerical methods.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Approximation and Errors in Computation	Errors, relative error, absolute error, error in series approximation.	02
2.	Algebraic and Transcendental Equations	Bisection Method, Regula- Falsi Method, Secant Method, Iterative method, Newton-Raphson Method, convergence.	07
3.	Interpolation	Finite Differences, Relation between difference operators, Newton's Forward and Backward Interpolation, Gauss Backward Interpolation, Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula, Lagrange's interpolation formula.	08
4.	Numerical Differentiation and Integration	Derivatives using Newton's Forward and Backward Interpolation, Bessel's and Sterling's central difference operators, Maxima and minima of a tabulated function. Trapezoidal, Simpson's, Boole's and Weddle's rules, Euler-Maclaurin formula.	11
5.	System of Linear Equations	Gauss Elimination method, LU decomposition method, Gauss-Seidel Method.	05

6.	Numerical Solution of Ordinary Differential Equations	Picard's method, Euler's method, Modified Euler's method, Fourth order Runge-Kutta method, Milne's method for first order, second order and simultaneous differential equations, Finite-Difference Method	09
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutorials, PBL)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	**C. F. Gerald and P.O. Wheatley,** Applied Numerical Analysis, 7th Ed., Pearson Education, 2004.
2.	**M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, 6th Ed., New Age International, New Delhi, 2014.
3.	**R. S. Gupta,** Elements of Numerical Analysis, 2nd Ed., Cambridge University Press, 2015.
4.	**S.D. Conte and C. deBoor,** Elementary Numerical Analysis, An Algorithmic Approach, 3rd Ed., McGraw-Hill, New York, 1980.

Statistical Information Theory with Applications (17B1NMA533)

Course Description

Course Code	17B1NMA533	**Semester** Odd	**Semester** V **Session** 2020-21 **Month from** Aug 2020- Dec 2020
Course Name	Statistical Information Theory with Applications		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Amit Srivastava	
	Teacher(s) (Alphabetically)	Dr. Amit Srivastava	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-8.1	explain the notions of information, entropy, relative entropy and mutual information.	Understanding Level(C2)
C301-8.2	explain fuzzy sets and compare the various measures of discrepancy.	Analyzing Level (C4)
C301-8.3	develop and compare Shannon-Fano and Huffman source codes using measures of uncertainty.	Analyzing Level (C4)
C301-8.4	analyse the notion of distance measure in pattern recognition generated in Intuitionistic fuzzy environment.	Analyzing Level (C4)
C301-8.5	apply information theoretic concepts in encryption and decryption.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Information Theoretic Measures	Review of Probability theory, Average information, Shannon and Renyi Entropy, Mutual information. Introduction to concepts of directed divergence, inaccuracy and information improvement	10
2.	Fuzzy Sets and Measures of Fuzzy Uncertainty.	Fuzzy Sets. Fuzzy Uncertainty and Fuzzy Information Measure, Similarity Measures, Fuzzy Measures of Directed Divergence, Total Ambiguity and Information Improvement, R-Norm Fuzzy Information Measure and its Generalizations.	10
3.	Source Coding	Data compression, Kraft-Mcmillan Equality and Compact Codes, Encoding of the source output, Shannon-Fano coding, Huffman coding, Lempel-Ziv (LZ) coding, Shannon-Fano-Elias Coding and Introduction to Arithmetic Coding. rate distortion	10

		theory, Lossy Source coding.	
4.	Applications of information theory in Cryptography	Basic concepts of cryptography and secure data, Mathematical Overview and Shannon theory of Cryptography, perfect secrecy and the one time pad, Spurious Keys & Unicity Distance, Classical and Product Cryptosystems. semantic security and Stream ciphers, Characteristics for perfect security, Limitations of perfectly secure encryption, Block and Stream ciphers, Cipher Modes, Substitution Ciphers, Mono-alphabetic Substitution and Poly-alphabetic Substitution, Polygram, Transposition Ciphers, Rail Fence, Scytale, Book cipher, Vernam cipher, Vigenere Tabluae, Playfair, Hill Cipher, Cryptanalysis of Classical Cryptosystems,	12
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz , Assignments, Tutorials, PBL)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	**Bose, R.**, Information Theory Coding and Cryptography, 3rd Ed, Tata McGraw-Hill, 2016.
2.	**Jain, K. C., and Srivastava, A.,** Information Theory & Coding, 3nd Ed, Genius Publications, 2009
3.	**Stallings, W.,** Cryptography and Network Security Principles and Practices, Prentice Hall, 2003
4.	**Cover, T.M. and Thomas, J. A.,** Elements of Information Theory, 2nd Edition, Wiley, 2006.
5.	**Haykin, S.,** Communication Systems, John Willey & Sons, Inc, Newyork, 4th Ed, 2006
6.	**Behrouz, A. F.,** Introduction to Cryptography and Network Security, McGraw-Hill International Edition, 2008

Logical Reasoning and Inequalities (18B12MA312)

Course Description

Course Code	18B12MA312	**Semester** Odd	**Semester** V **Session** 2020-21 **Month from** Aug 2020- Dec 2020	
Course Name	Logical Reasoning and Inequalities			
Credits	3		**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Lakhveer Kaur		
	Teacher(s) (Alphabetically)	Dr. Lakhveer Kaur		

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C301-9.1	interpret the mathematical foundation of various inequalities.	Understanding level(C2)
C301-9.2	examine inequalities in the field of information theory and cryptography.	Analyzing level(C4)
C301-9.3	apply the concepts of permutation and combination of multi sets in combinatorics.	Applying level(C3)
C301-9.4	apply special numbers in combinatorial and number theoretic problems.	Applying level(C3)
C301-9.5	explain the basic concepts of logical reasoning and solve related problems.	Understanding level(C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Inequalities	Basic Inequalities, Inequalities between means with special reference to AGM inequality, Jensen inequality for concave and convex functions, Hermite hadamard inequality, Karamata's inequality, Popoviciu's inequality, Weighted AGM inequality and Young's inequality with applications in information theory. Bounds on Shannon entropy function and their generalizations. Perfect secrecy in cryptography.	12
2.	Basics of Counting	Pigeon Hole Principle, Binomial Theorem, Properties of binomial coefficients, combinatorial identities, Permutation of Multisets, Multinomial Theorem, Combinations of Multisets, Sterling's Formula, Generalization of Binomial coefficients, Inclusion exclusion principle.	12
3.	Special numbers	Catalan numbers, Partition numbers, difference sequences, Sterling Numbers, Perfect numbers.	10
4.	Logical Reasoning	Clocks, calendars, binary logic, seating arrangement, blood relations, logical sequence, assumption, premise, conclusion, linear and matrix arrangement, Syllogism, Binary Logic, Logical sequence & Matching, Mathematical Puzzles with	8

		applications.	
Total number of Lectures			**42**
Evaluation Criteria **Components**		**Maximum Marks**	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials, PBL)	
Total		**100**	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	**Cerone, P. and Dragomir, S. S.**, Mathematical Inequalities, CRC Press, Boca Raton, FL, 2011		
2.	**Praveen, R. V.**, Quantitative Aptitude and Reasoning, Second Edition, Prentice Hall India, 2013.		
3.	**Rosen & Kenneth H**, Discrete Mathematics and its Applications, Tata Mc-Graw Hill, New Delhi, 2007.		
4.	**Kolman, B., Busby, R. C. and Ross, S.,** Discrete Mathematical Structures, 6th Edition, Prentice Hall, 2018.		
5.	**Simmons, G. J.,** The Great Book of Puzzles & Teasers, 1999.		

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B1NHS434	**Semester : ODD**	**Semester V Session 2020-21 July - December**
Subject Name	**Introduction to Contemporary Forms of Literature**		
Credits	**3**	**Contact Hours**	**3 (3-0-0)**

Faculty (Names)	**Coordinator(s)**	**Dr. Monali Bhattacharya (Sector 62)**
	Teacher(s) (Alphabetically)	**Dr. Monali Bhattacharya**

Course Outcomes:

	Course Outcome	**COGNITIVE LEVELS**
C303-6.1	Interpret & relate with the genres, periods, and conventional as well as experimental forms of literature as current ethical, technological and cultural reflections of society.	CL-2 Understand
C303-6.2	Apply literary and linguistic theories on the texts to identify them as cultural constructs inculcating human values in the society.	CL-3 Apply
C303-6.3	Analyze social, cultural, moral and linguistic changes in contemporary world through cloze study of select representative texts of different cultures thematically and stylistically.	CL-4 Analyse
C303-6.4	Determine the reciprocal relationship between the individual and culture individually and/or through a research based paper/poster presentation with an aim to analyze social, cultural and moral fibre of youth in multidisciplinary environment, giving holistic solutions for sustainable development of society.	CL-5 Evaluate
C303-6.5	Create literary, non-literary write-up with proper applied grammar usage, having moral and cultural significance for today's world individually and in a team.	CL-6 Create

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Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Hours for the module**
1.	**Introducing Literary Theories**	• From Formalism to Reader Response Theory: Major Terms & Concepts • Narrative Art & Narratology • Language & Style: An Introduction	12
2.	**Introducing New Forms & Sub Genres Today: Features & Portions**	• New Fiction: Graphic Novels, Cyberpunk • Non Fiction: Memoirs &	6

		Autobiographies, Biographies & Personal Narrative	
3.	**Spiritual Literature**	*Siddhartha*- Hermen Hesse (novella)	4
4.	**Travel Literature**	*Eat, Pray & Love (Travelogue & cinematic adaptation)*	4
5.	**Written Communication Through Non-Fiction**	*Diary, Blog, Travelogue*	4
6.	**Commonwealth / Post Colonial Literature**	*Hayavadana (Short Play)*- Girish Karnad	4
7.	**European Literature**	*Brave New World – Aldous Huxley (Science Fiction)*	4
8	**Canadian Literature**	*The Penelopiad- Margaret Atwood*	4
		Total number of Hours	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Project, Class Interaction)
Total	**100**

Recommended Reading material:

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Margaret Atwood, 'The Penelopiad', 1st Edition, Canongate Series, Knopf, Canada, 2005.
2.	M.H. Abrams, 'A Glossary of Literary Terms'.7th Edition, Hienle & Hienle: Thomson Learning, USA, 1999.
3	Mark William Roche, 'Why Literature matters in the 21st Century', 1st Edition, Yale University Press, 2004.
4	Girish Karnad, 'Hayavadana', 1st Edition, Oxford University Press, Delhi, 1975 (30th Impression, 2012).
5	Aldous Huxley, 'Brave New World', 1st Edition, Harper Collins, 2004.
6	Hermen Hesse, 'Siddhartha', 1st Edition. New Directions, US, 1951. For online version: https://www.gutenberg.org
7	Elizabeth Gilbert, 'Eat, Pray & Love. 1st Edition, Penguin,US, 2006.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NHS531	**Semester ODD**	**Semester V Session** 2020 -2021 **Month from July - Dec**
Course Name	Technology and Culture		
Credits	3	**Contact Hours**	**(3-0-0)**

Faculty (Names)	**Coordinator(s)**	Dr Swati Sharma
	Teacher(s) (Alphabetically)	Dr Swati Sharma

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-5.1	Understand the main theories in cultural management,	Applying (C 2)
C303-5.2	Appraise technological convergence and cultural divergence, relate the differences to the literature and suggest solutions	Evaluating(C 5)
C303-5.3	Interpret and communicate effectively in physical and virtual teams by evaluating appropriate concepts, logic and selecting the apt IT tools.	Evaluating (C5)
C303-5.4	Evaluation of the theoretical knowledge to adapt to cultural differences in global work environment.	Evaluating(C 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	▪ Genealogy of the concept ▪ The Information Technology Revolution ▪ The concept of Network societies	7
2.	Dimensions of Culture	▪ Evolution of Culture ▪ Principal theories of Culture: Kluckholn and Strodtbeck, Hofstede, Trompenaars and Schwartz ▪ Cultural Diversity and cross cultural literacy	12
3.	Cross cultural communication in physical and virtual teams	▪ The Communication Process ▪ Language and Culture ▪ Non Verbal Communication ▪ Barriers to Cross Cultural Understanding	7
4.	Negotiation and Decision Making	▪ Theories of Negotiation ▪ Negotiation and Intercultural Communication ▪ Decision making in cross cultural environment	8
5.	Cross Culture and Leadership	▪ Leadership and Culture ▪ Theories of Culture centric leadership and their Global Relevance ▪ Developing Competencies for Global citizens	8

		▪ Women as International Leaders ▪ Cross Cultural Training ▪ Ethical Guidelines for Global Citizens	
			Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project and Oral Viva)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Cateora, P. R., Meyer, R. B. M. F., Gilly, M. C., & Graham, J. L. (2020). *International marketing*. McGraw-Hill Education.
2.	Coyle,D., The Culture Code: The Secrets of Highly Successful Groups, Bantam, 2018
3.	Fletcher, R., & Crawford, H. (2013). *International marketing: an Asia-Pacific perspective*. Pearson Higher Education AU.
4.	Gerard Bannon, J. (red.). Mattock, Cross-cultural Communication: The Essential Guide to International Business.2003
5.	Maidenhead.Riding the Waves of Culture: Understanding Cultural Diversity in Business (2012).3rd edition. McGraw Hill.
6.	Madhavan,S., Cross Cultural Management: Concepts and Cases(2nd Ed),Oxfor University Press 2016.
7.	Robertson, Ronald. Globalization: Social theory and global culture, London: Sage, 1992.

Detailed Syllabus
Lecture-wise Breakup

Course Code	**20B13HS311**	**Semester: Odd**	**Semester: V Session: 2020-21** **Month: JULY-DECEMBER**
Course Name	**Indian Constitution and Traditional Knowledge**		
Credits	**3**	**Contact Hours**	**3**(3-0-0)

Faculty (Names)	**Coordinator(s)**	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	• Dr. Chandrima Chaudhuri • Dr. Praveen Sharma • Dr. Santosh Dev • Ms. Shikha Kumari • Dr. Swati Sharma

CO Code	**COURSE OUTCOMES**	**COGNITIVE LEVELS**
C305.1	Demonstrate an understanding about the early Indian traditional political thought and the current Indian political scenario by knowing about the structure of government in place	Understand(C2)
C305.2	Demonstrate an understanding of the role of Indian President, Prime Minister, Governor, other members of the legislature and local governments as representatives of the common masses	Understand (C2)
C305.3	Analyze the working of Indian federalism with reference to centre-state relations	Analyze(C4)
C305.4	Analyze the impact of the contemporary challenges such as caste and gender to the working of Indian democracy	Analyze(C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	The Indian Constitution	• Historical Background to the Indian Constitution • Salient features of the Indian Constitution • Fundamental Rights (Part III of the Indian Constitution) • Fundamental Duties (Part IVA of the Indian Constitution) • Directive Principles of the State Policy (Part IV of the Indian Constitution)	8
2.	Organs of the	• The Executive: President, Prime Minister	8

	Government	and Governor- appointment, powers and functions • The Legislature: Parliament and its components- Lok Sabha and Rajya Sabha (composition and functions) • The Judiciary: Supreme Court-composition, functions, appointment and jurisdiction	
3.	Nature of Federalism in India	• Centre-State Legislative Relations • Centre-State Administrative Relations • Centre-State Financial Relations • Special Provisions of some state and the 5th and 6th schedule	8
4.	Local Governance in India	• Urban local governance: Municipality- Structure & Functions • Rural Local governance: Panchayat- Organization and Powers • Civil Society: the participation of the people in local governance	8
5.	Traditional knowledge	• Kautilya- Theory of state • Mandala theory • Saptanga theory	6
6.	Challenges to Indian Democracy	• Caste as a critical factor in the Indian Constitution • Gender as critical to the process of Constutionalization	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance, Quiz, Project)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	A.A. George, *Important Judgements that transformed India*, New Delhi: McGraw Hill, 2020
2.	B. Chakraborty, *Indian Constitution: Text, Context and Interpretation*, New Delhi: Sage Publications, 2017
3.	B.K.Sharma, *Introduction to the Constitution of India*, New Delhi: Prentice Hall of India, 2002
4.	M.Laxmikanth, *Indian Polity*, 6th edition, Noida: McGraw Hill, 2019
5.	M.P.Singh and R. Saxena, R, *Indian Politics: Contemporary Issues and Concerns*, New Delhi: PHI Learning, 2008
6.	R. Kangle, *Arthashashtra of Kautilya*, New Delhi: Motilal Publishers, 1997