Course Co	ode	18B12EC411	l	Semester Eve (specify Odd/)	n E <b>ven)</b>	Semeste Month f	ster VIII Session 2018 -2019 h from January to June			
Course Na	me	Introduction	to IOT							
Credits			4		Contact I	Hours	3L+2T			
Faculty (Names)         Coordinator(s)         Dr. Gaurav Vern			rma (62)							
Teacher(s) (Alphabetically)Mr. Abhay Kumar (128)										
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS	
CO1	Outlin consid	e the basic c erations in IO	oncepts )T scen <i>t</i>	of IOT with r vrio.	networking	and pro	tocol	Understan	ding (C2)	
CO2	Identi variou	fy various IO is sensors and	Г hardw actuato	vare platforms : ors.	and their u	tilization	with	Applying	(C3)	
СО3	Exper use of learni	iment the bas f them in im ng application	ic conce lage pr ls.	epts of python ocessing, data	programm analytics	ing and i and ma	make chine	Applying	(C3)	
CO4	Exami scenar	ine various c io for monito	case stu ring, col	dies and cloud ntrol and analy	d platform sis.	is in an	ΙΟΤ	Analyzing	s (C4)	
Module No.	Title o Modu	f the le	Topics	Topics in the Module					No. of Lectures for the module	
1.	IOT B Import	asics and its ance	Introdu Conne IOT Comm Evolut Compa (M2M Web o Termin Gatew Prefix Conce	the mo troduction to IOT (People Connecting to Things, Things connecting to Things, Definition of IOT, History of IOT), OT Components (Sensors & Actuators, Things, communications, Networks, The Internet, Protocol Stack), cvolution of Connected Devices, IOT Applications, IOT companies, Baseline Technologies (Machine to Machine M2M) Communication, Cyber Physical Systems (CPS), Veb of Things (WOT)), Address Crunch in IOT, IOT cerminologies (IOT Node, LAN, MAN & WAN, IOT Gateway & Proxy), IOT Network Configuration (Gateway Prefix Allotment, Impact of Mobility on Addressing, concept of Tunneling, Multi-homing), IPv4 Versus IPv6					6	
2.	Basics Netwo	of IOT rking	Introdu Techno Layer, Netwo IoT N Area I RFID, networ Applic HTTPS conside	ept of Tunneling, Multi-homing), IPv4 Versus IPv6. duction to IOT Networking, Networking Standards and nologies (Network Access & Physical Layer, Internet r, Transport Layer, The application layer), IOT 'orking Protocols, Network Access and Physical layer Network Technologies ((LPWAN (Low Power Wide Network), Cellular, Bluetooth Low Energy (BLE), NFC, Zigbee, Wifi, Ethernet), Internet layer IoT ork technologies (IPv6, 6LoWPAN, and RPL), ication layer IoT network technologies (HTTP, PS, MQTT, AMQP, and XMPP), IoT networking iderations and challenges, IoT Platforms Capabilities.				6		
3.	IoT su	pported	Introdu	action to Arduin	o (Differen	t Arduino	boards	s, Arduino	12	

	Hardware platforms (Arduino) & data visualization using cloud.	Uno board description and its pin configuration, Arduino IDE and program uploading, different functions related to GPIOs and special functions (PWM and Serial communication), Interfacing with Arduino using processing language (LED, Switch, Seven Segment, LCD, DC Motor, Relay, IR, LDR and DHT11 sensor), Interrupts, use of simulator and compiler, basics of HTML, Arduino supported IOT modules (Ethernet & Wifi Shield) and their configuration, Monitoring of sensor data on cloud and Web based controlling of actuators.			
4.	Introduction to Python, Data Analytics, Machine Learning and Case Studies.	Introduction to python, python IDE, Data types, various programming constructs (loops, if, else etc.), operators, functions, modules, data handling (pandas), file operations, Image operations (PIL-pillow), data plotting in python (Matplotlib), basics of machine learning in python (Scikit) and related case studies.	10		
5.	IoT supported Hardware platforms (Raspberry pi) & its Applications	Introduction to Raspberry pi (Raspberry pi different model comparison, Pin Configuration, Raspberry Pi operating system choices, Set up your Raspberry pi, Raspbian OS, Remote Access using SSH, Remote Access using TightVNC), Interfacing with Raspberry pi using python and use of open source libraries (LED, Switch, LCD, DC Motor, Relay, IR, LDR and DHT11 sensor), IOT Applications (Water management system, Weather monitoring station on cloud, Smart Agriculture System, Smart Energy meter, Pollution Monitoring system, Smart Dustbin management system.	8		
	<u>.</u>	Total number of Lectures	42		
Eval	uation Criteria				
Com T1 T2 End 3 TA Tota	Evaluation CriteriaComponentsMaximum MarksT120T220End Semester Examination35TA25 (Assignments, Attendance & Quiz)Total100				
Reco Refe	ommended Reading materia rence Books, Journals, Repo	al: Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format)	( Text books,		
(		achling Tachnologian Distforma and Use Cases" by Dathum D	ai and Anunama		
1.	"The Internet of Things: Er C. Raman (CRC Press)	labiling Technologies, Platfornis, and Use Cases, by Pethuru K	aj and Anupama		

Course Code	17B11EC733	Semester EVEN		Semester VIII Session 2018 -2019 Month from January		
Course Name	Optical Communicat	Dptical Communication				
Credits	4		Contact Hours		4	
Faculty (Names)	Coordinator(s)	Dr. Amit Kum	ar Goyal			
	Teacher(s)     Dr. Amit Kur       (Alphabetically)     Dr. Amit Kur		ar Goyal			

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Develop an understanding of optical fiber, its structure, types, propagation and transmission properties.	Remembering (C1)
CO2	Identify and examine the different kinds of losses and signal distortion in optical Fibers.	Analyzing (C4)
CO3	Classify the Optical sources and detectors and their principle of operation.	Understanding (C2)
CO4	Design a fiber optic link based on budget analysis.	Evaluating (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Overview of Optical fiber Communications	Electromagnetic Spectrum, Historical development and advantages of optical fiber communication, Elements of optical fiber transmission link, Optical laws and definitions, optical fiber modes and configurations.	3
2.	Optical fibers Structures	Optical fiber wave guides, Ray theory transmission, TIR, Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fibers Modes, V Number, Mode Coupling, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index.	4
3.	Signal Degradation in Optical fibers	Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity, Group delay, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion, Pulse broadening. Optical fiber Connectors- Connector types, Single mode fiber connectors, Connector return loss.	7
4.	Optical Sources	Light emitting diode (LEDs)-structures, materials, Figure of merits, Quantum efficiency, Power, Modulation, Power bandwidth product. Laser Diodes -Modes & threshold conditions, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, temperature effects, external quantum efficiency, laser diode rate equations. Reliability of LED & LD.	6

5.	Power Launching and Coupling	Source to fiber power launching: - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, LED coupling to single mode fiber. Fiber Splicing- Splicing techniques, splicing single	6
		mode fibers. Multimode fiber joints and single mode fiber joints. Fiber alignment and joint loss.	
6.	Photodetectors& Receivers	Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation:- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers.	7
7.	Optical system design	Considerations, component choice, multiplexing. Point-to- point links, System considerations, Link considerations. Overall fiber dispersion in multi mode and single mode fibers. Rise time considerations. Distance consideration in optical transmission system. Line coding in Optical links, WDM Principles & Types of WDM, Measurement of Attenuation and Dispersion, Eye pattern.	7
		Total number of Lectures	40
Evaluation	n Criteria		
Componer T1 T2 End Semes TA Total	its ter Examination	Maximum Marks           20           20           35           25           100	
Recommender Reference	nded Reading materi Books, Journals, Repo	<b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( rts, Websites etc. in the IEEE format)	Text books,

1.	Gerd Keiser,	Optical Fiber	Communications,	3rd Edition,	McGraw-Hill	International edition, 2000.
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2.	John M.	Senior,	Optical	Fiber	Communi	ications,	2nd	Edition,	PHI,	2002.
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**3.** D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Fiber Optic Communications, Pearson Education, 2005.

4. Govind P. Agarwal, Fiber Optic Communication Systems, 3rd Edition, John Wiley, 2004.

5. Joseph C. Palais, Fiber Optic Communications, 4th Edition, Pearson Education, 2004

Subject Code	17B1NEC735		Semester	Even	Semester 8 <sup>th</sup> year 2019
					Month from: Jan 2019
Subject Name Information Theory and			1 Applications		
Credits 4		Contact Hours		4	
		)r	- ir		
Faculty (Names)		Coordinator(s)	Dr. Alok Joshi, Dr. Neetu Singh		
		Teacher(s) (Alphabetically)	Dr. Alok Joshi,	Dr. Neetu S	Singh

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Understand the concept of probability, its relation with information, entropy, and their application in communication systems.	Understanding (C2)
CO2	Identify theoretical and practical requirements for implementing and designing compression algorithms.	Analyzing (C4)
CO3	Analyze the relationship between bandwidth and capacity of communication channels and its importance in real life communication systems.	Analyzing (C4)
CO4	Analyze the need for channel coding in digital communication systems.	Analyzing (C4)
CO5	Generate error correcting codes for error detection and correction.	Analyzing (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
	Linear Block Codes	Algebra Background, Groups, Fields, Binary field arithmetic. Vector Spaces over GF(2).	
6.		Generator and parity check matrices. Syndrome and error detection. Standard array and syndrome decoding. Hamming codes.	8
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 Crit	teria	Total number of Lectures	42
Evaluation Crit	teria Maximum Ma	Total number of Lectures	42
<b>Evaluation Crit</b> <b>Components</b> T1 T2	teria Maximum Ma 20 20	Total number of Lectures	42
<b>Evaluation Crit</b> <b>Components</b> T1 T2 End Semester E	teria Maximum Ma 20 20 20 xamination 35	Total number of Lectures	42
<b>Evaluation Crit</b> <b>Components</b> T1 T2 End Semester E TA	teria Maximum Ma 20 20 xamination 35 25(Attendanc	Total number of Lectures	42
Evaluation Crit Components T1 T2 End Semester E2 TA Total	teria Maximum Ma 20 20 xamination 35 25(Attendance 100	Total number of Lectures	42
Evaluation Crit Components T1 T2 End Semester E TA Total Recommended Reference Books	teria Maximum Ma 20 20 xamination 35 25(Attendance 100 Reading material: Author(s), Tit a, Journals, Reports, Websites etc.	Total number of Lectures urks e, Performance. Assignment/Quiz) le, Edition, Publisher, Year of Publication etc. ( in the IEEE format)	42 ( Text books,
Evaluation Crit Components T1 T2 End Semester E TA Total Recommended Reference Books 1.	teria Maximum Ma 20 20 xamination 35 25(Attendance 100 Reading material: Author(s), Tit a, Journals, Reports, Websites etc. R.B. ASH: Information Theory,	Total number of Lectures urks e, Performance. Assignment/Quiz) le, Edition, Publisher, Year of Publication etc. ( in the IEEE format) Dover, 1990	42 ( Text books,
Evaluation Crit Components T1 T2 End Semester E TA Total Recommended Reference Books 1. 2.	teria Maximum Ma 20 20 xamination 35 25(Attendance 100 Reading material: Author(s), Tit 5, Journals, Reports, Websites etc. R.B. ASH: Information Theory, RANJAN BOSE: Information theory	Total number of Lectures arks e, Performance. Assignment/Quiz) le, Edition, Publisher, Year of Publication etc. ( in the IEEE format) Dover, 1990 ory, coding and cryptography, Macgraw Hill 2008	42 (Text books,
Evaluation Crit Components T1 T2 End Semester E: TA Total Recommended Reference Books 1. 2. 3.	teria Maximum Ma 20 20 xamination 35 25(Attendance 100 Reading material: Author(s), Tit , Journals, Reports, Websites etc. R.B. ASH: Information Theory, RANJAN BOSE: Information theo R.W. YEUNG: Information The	Total number of Lectures Total number of Lectures nrks e, Performance. Assignment/Quiz) le, Edition, Publisher, Year of Publication etc. ( in the IEEE format) Dover, 1990 ory, coding and cryptography, Macgraw Hill 2008 ory and Network Coding, Springer, 2008	42 ( Text books,
Evaluation Crit Components T1 T2 End Semester E: TA Total Recommended Reference Books 1. 2. 3. 4.	teria Maximum Ma 20 20 xamination 35 25(Attendance 100 Reading material: Author(s), Tit , Journals, Reports, Websites etc. R.B. ASH: Information Theory, RANJAN BOSE: Information theo R.W. YEUNG: Information The SHU LIN & D.J. COSTELLO: En	Total number of Lectures Total number of Lectures In the set of	42 ( Text books,

Course Code		18B12EC412	2	SemesterEvenSemester 8th(specify Odd/Even)Month from Ja		Session 2018 -2019 an to June			
Course Name		Multimedia (	ultimedia Communications						
Credits			4		Contact Hours			4	
Faculty (N	ames)	Coordinato	r(s)	Dr. Richa Gup	ta				
		Teacher(s) (Alphabetica	ully)	Dr. Richa Gup	ta				
<b>COURSE</b> Upon cor	<b>OUTCC</b> npletio	<b>DMES</b> on of the cou	rse, the	e students wil	l be able t	0		COGNITIVE LEVELS	
CO1	familia various	rize with basic s construction	s of dat algorith	a compression u	used in the d odes.	levelopme	ent of	Арр	lying (C3)
CO2	identif design	y theoretical a ing of Error Re	nd pract esilient (	tical requiremen Codes.	ts for imple	ementation	n and	App	lying (C3)
СОЗ	learn f its app	undamentals of lications.	of transf	orm coding, dig	ital image <sub>l</sub>	processing	g and	App	lying (C3)
CO4	analys disting	analyse the need of image compression & video compression and Analyzing (C4) distinguish between different imageCODECs.					yzing (C4)		
CO5	familiarize with psychoacoustic principle used in the development of audio codec standards. Analyzing (C4)					yzing (C4)			
Module No.	Title o Modul	f the le	Topics	s in the Module					No. of Lectures for the module
1.	Reviev Inform	v of ation Theory	Introdu and co	uction, Informati nditional entrop	on Measure ies.	e, Discrete	e entro	py. Joint	3
2.	Data CompressionUniquely Decipherable Codes and Instantaneous Codes. Kraft - McMillan inequality. Noiseless coding Theorem. Data Compression: Lossless Compression and Lossy Compression. Optimal codes. Construction algorithms of source codes – Huffman Codes, Shannon - Fano codes, Arithmetic Codes, Lempel Ziv Welch Code and Run Length Coding.				8				
3.	Error F Codes	Error Resilient CodesReversible Variable Length Codes: Introduction, Types of RVLCs, Construction Algorithms of Symmetrical and Asymmetrical RVLCs. Applications of RVLCs in Multimedia Communications.8					8		
4.	Multimedia Communications.MultimediaInformationRepresentation andTransform CodingCosine Transforms – 1 D and 2D. Energy compaction.				3				

5.	Digital ProcessingImage ImageBasics of digital image processing, Structure of the Picture Information, luminance and chrominance components, RGB components. Image Enhancement, Image segmentation, Image Restoration and Morphological Image Processing.				
6.	Image Compression	Basics of Image Compression, Joint Photographic Expert Group (JPEG) compression.	3		
7.	Video Compression	Basic principle of video processing, I, P and B pictures in video content, Structure of video frame, Macroblock, Motion Estimation and Compensation, Compression on the block level, Video Coding Standards.	4		
8.	Audio Compression	Basics of Audio Signal Processing, Principle of Psychoacoustic and its applications, Audio Compression and Standards for Audio codec.	4		
		Total number of Lectures	45		
Eval	uation Criteria				
ComponentsMaximum MarksT120T220End Semester Examination35TA25 (Tutorial marks, Attendance, Class performance, Assignment, Quiz)Total100					
Reco Refer	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)				
1.	M. Bosi and R. Goldberg, Introduction to Digital Audio Coding and Standards. Kluwer Academic, Boston, 2003.				
2.	R. C. Gonzalez and R. E. Woods, Digital Image Processing Using MATLAB, Prentice Hall, 2009.				
3.	K. Sayood, Introduction to data compression, Elsevier, 4 <sup>th</sup> edition.				
4.	A. K. Jain, Fundamentals	of Digital Image Processing, Prentice Hall, 1989.			

Course Code	16BINEC831	Semester Even (specify Odd/Even)		Semeste Month 1	er 8th Session 2018-2019 from Jan
Course Name	Sonar System and Acoustic Imaging				
Credits	4		Contact Hours		4
Faculty (Names)	Coordinator(s)	Dr. Kapil Dev Tyagi			
	Teacher(s) (Alphabetically)	Dr. Kapil Dev	Tyagi		

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Define and explain sonar terminology and choose parameters for side scan sonar according to the required azimuth and range resolutions.	Applying (C3)
CO2	Select parameters for synthetic aperture sonar (SAS) as per the design requirements.	Applying (C3)
CO3	Analyze the continuous time frequency modulation (CTFM) technique for sonar applications.	Analyzing (C4)
CO4	Apply and discover signal processing application for ship speed measurement system like JANUS.	Analyzing (C4)
CO5	Take part in the development of simple array design for acoustic localization.	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Sonars	Introduction to sonar system. Side scan sonar, sector scan sonar, beam-forming methods in sector scan sonar, swept frequency delay line scanning, phase beam-forming, modulation scanning, array beam-forming, DFT beam- former.	12
2.	Synthetic aperture sonar	Limitation of scanning sonar, Basic of synthetic aperture sonar, matched filtering Doppler shift aspects, range resolution in synthetic aperture sonar, minimum sampling rate for synthetic aperture sonar, spot lights, and squints in synthetic aperture sonar, continuous time frequency modulation technique (CTFM), blind time problem in CTFM,dual demodulator CTFM technique, phase difference radial projection method.	14
3.	Acoustic localization techniques	Estimation of moving target speed in water, GPS,DGPS,SQUID, Doppler log, JANUS, Issues in Doppler log methods, correlation-log, Localization using time delay estimation, Beacons, Pingers, Localization using three hydrophones, Localization using four hydrophones, Non-planar array using five hydrophones.	16
Total number of Lectures			
Evaluatior	n Criteria		
Components		Maximum Marks	

T1	20
T2	20
End Semester Examination	35
ТА	25
Total	100

Recommender Reference B	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)					
1. Lawrence J. Ziomek, An Introduction to Sonar Systems Engineering, Taylor & Francis Inc, 2017.						
2.	A. D. Waite, <b>Sonar for Practising Engineers</b> , 3 <sup>rd</sup> edition, John Wiley & Sons, 2002.					
3.	Authors: Au, Whitlow W.L. The Sonar of Dolphins, Springer-Verlag New York, ISBN 978-1-4612-4356-4, 1993.					

Course Code	16B1NEC733	Semester Even		Semester VIII <sup>th</sup> Session 2018-2019 Month from Jan		
Course Name	Antenna Theory and Radio Wave Propagation					
Credits	4	Contact Hours		Iours	4	
Faculty (Names)	Coordinator(s)	Vishal Narain Saxena				
	Teacher(s) (Alphabetically)	Vishal Narain Saxena				

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Recall the concepts of Electromagnetic field theory, classify different types of antennas, illustrate antenna parameters and demonstrate the effect on antenna parameters due to changes in the physical dimensions.	Understanding (Level II)
CO2	Compare Broadband Antennas, Frequency Independent antennas and Aperture antennas. Explain Array Antennas and identify the E and H fields for the antennas.	Applying (Level III)
CO3	Design Reconfigurable antenna, Active antenna, Dielectric antennas and measure radiation pattern, polarization and VSWR.	Creating (Level VI)
CO4	Define terminology relevant to mode of propagation and examine the propagation of radio waves in different atmospheres.	Analyzing (Level IV)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Radiation Fundamentals & Antenna Parameters	Antenna types, radiation, use of potential functions, radiated fields, far fields, Radiation from current element, Infinitesimal dipole, antenna parameters, radiation pattern, Directivity, numerical evaluation of directivity, Gain, efficiency, impedance, Loss resistance, Polarization, equivalent area, effective area and its relation to gain	8
2.	Linear Antennas Loop Antennas	Linear antennas, current distribution Total power, radiation resistance, Short-dipole, center-fed dipole, Half-wave dipole, dipole characteristics, folded dipole, Small loop antenna, Loop characteristics	7
3.	Antenna Arrays	Antenna arrays, Broadside and end-fire arrays, Hansen- Woodyard array, binomial arrays, Array theory Scan blindness in array theory ,Aperiodic arrays	7
4.	Broadband Antennas, Frequency Independent antennas & Aperture antennas	Yagi-Uda arrays, helical antennas Log-periodic antenna Fields as sources of radiation; Horn antennas, Reflector antennas	7
5.	Modern antennas-	Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR	6

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6.	Propagation of	Modes of propagation, Structure of atmosphere, Ground	8
	Radio Waves	wave propagation, Free Space Wave Propagation, Ground	
		Reflection, Surface Waves, Tropospheric propagation ,	
		Duct propagation, Troposcatter propagation, Flat earth and	
		Curved earth concept, Ionospheric propagation, Sky wave	
		propagation – Virtual height, critical frequency, Maximum	
		usable frequency - Skip distance, Fading, Multi hop	
		propagation, Electrical Properties of Ionosphere	
		Total number of Lectures	43
Eval	uation Criteria		
Com	ponents	Maximum Marks	
T1		20	
T2		20	
End	Semester Examination	35	
TA		25 (Tutorial, assignment and presentation)	
Tota	l	100	
			·
Reco	mmended Reading mate	rial: Author(s), Title, Edition, Publisher, Year of Publication etc.	(Text books,
Refe	rence Books, Journals, Rep	ports, Websites etc. in the IEEE format)	
1.	John D. Kraus & RJ Marl	hefka, Antennas for all applications, The McGraw-Hill Companie	$(12^{\rm nd}/3^{\rm rd})$
	edition, 2006	-1	
2.	C.A. Balanis, Antenna Th	heory, Analysis and Design. NY: John Wiley and Sons, 2 <sup>nd</sup> edition	n, 2002

3.	WL Stutzman& GA Thiele, Antenna Theory and Design, John Wiley and Sons, 2 <sup>nd</sup> edition,1997
4	Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of

**4.** India, 2006

Course Co	ode	17B1NEC74	1	Semester EVENSemester VIII(specify Odd/Even)Month from J			I <b>Session</b> 2018 -2019 Jan-Jun		
Course Na	me	Digital Hardy	vare De	sign					
Credits			4		Contact I	Hours		4	
Faculty (N	(ames)	Coordinator	r(s)	Shruti Kalra					
		Teacher(s) (Alphabetica	lly)	Shruti Kalra					
COURSE	COURSE OUTCOMES COGNITIVE LEVELS						IVE LEVELS		
CO1	Recall the basics of digital hardware design, structured specification, application and basic concepts of hardware descriptive language.					on,	Ren (J	nembering Level I)	
CO2	Illustra system	te the problem s design and ir	s in syn nplemei	chronous and as ntation.	synchronous	digital		Und (I	erstanding Level II)
CO3	Identif	y and solve clo	ocking i	ssues in digital s	systems			A (L	.pplying .evel III)
CO4	Analyze faults or abnormalities in the digital systems						A (L	nalyzing ævel IV)	
CO5	Explain digital circuit development flow that captures functional specification, design, simulation, synthesis, implementation and testing on FPGA hardware				sting	Evaluat Ass (I	ting (Through signment) Level V)		
Module	le Title of the Topics in the Module						No. of		

Nodule No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	<ul> <li>i. What – What is meant by Digital Hardware Design</li> <li>ii. Why – Why we need it; Structured Specification of</li> <li>Hardware; Applications</li> <li>iii. How – How can we achieve it.</li> <li>a. Digital Design Flow</li> <li>b. Hardware Design Environment- Design, Verification,</li> <li>Deliverables</li> <li>c. Hardware Description Languages</li> <li>d. FSM modeling</li> <li>e. ASM charts</li> </ul>	2
2.	Modeling Hardware with HDL	Importance of HDL, Basic Language elements, Behavioral, structural, dataflow, subprograms and overloading.	9
3.	Clocking of Sequential Circuits	Difficulty in clock distribution, setup time, hold time, clock skew, clock jitter, one-phase clocking, two phase clocking, clock distribution networks	5
4.	Finite State Machine (FSM)	FSM Design methodology, State Reduction, State Assignment, Implementation, and state diagram partitioning	8
5.	Asynchronous Finite State Machines	Asynchronous Analysis, Design of Asynchronous Machines, Flow table realization, reduction, state assignments and design, Cycle and race analysis. Hazards, Essential Hazards, and its removal	13

6.	Fault Analysis	3					
		Total number of Lectures	40				
Eval	luation Criteria						
Com	ponents	Maximum Marks					
T1	-	20					
T2		20					
End	Semester Examination	35					
TA		25 (10 Assignment+ 5 Quiz + 10 (Attendance + behaviour))					
Tota	ıl	100					
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books,							
Refe	erence Books, Journals, Rep	ports, Websites etc. in the IEEE format)					
1.	W. Fletcher: An Engineering approach to digital design, PHI, 2012						

2 C.H. Roth: Digital systems design using VHDL. Wadsworth Publ. Co., 1998.

3. Z. Kohavi: Switching and Finite Automata Theory, 2<sup>nd</sup> Edition, Tata Mc-Graw Hill, 2001

4. A. Anand Kumar: Fundamental of Digital Circuits, PHI, 2<sup>nd</sup> Edition 2012

Course Co	ode	18B12EC417	Semester Eve (specify Odd/)	n E <b>ven</b> )	Semester VIII Session 2018 -2019 Month from January to May		Session 2018 -2019 anuary to May	
Course Na	me	Satellite Communica	tion					
Credits		4		Contact I	Iours		4	
Faculty (N	ames)	Coordinator(s)	Dr. Abhishek Kashyap					
		Teacher(s) (Alphabetically)	Dr. Abhishek Kashyap, Dr. Dharmendra J			endra Jl	Ihariya	
COURSE	OUTCO	OMES					COGNITIVE LEVELS	
CO1	Define Satellite and its historical background, outline the basic concepts of Satellite communications, recall the Kepler's laws of planetary motion						Remembering (Level I)	
CO2	Develop the equations of the orbit, explain the satellite launching and launch vehicles and outline terminology of earth-orbiting Satellites.						Analyzing (Level IV)	
CO3	Demonstrate the space segment, antenna subsystem, estimate different parameters and design uplink and downlink. Creating (Level VI)							
CO4	Apply various multiple access techniques for satellite communication and analyze Noise and Bandwidth. Also Interpret applications of various types of satellites established in different earth orbits.Evaluating (Level V)							

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to the Subject and its Importance. Contents. Books and Reading References. Evaluation. Space Environment. Artificial Satellites. Communication Satellites.	4
2.	Satellite Orbits and Frequency Bands	Orbital Mechanics. Orbits Employed for Satellite Communication like LEO, MEO & GEO, their Merits and Demerits. Satellite Launching. Launch Vehicles. Radio Wave Propagation Effects. Communication Window.	8
3.	Communication Satellites and Link Design	Geostationary Communication Satellite-Transponder. Ground Station System. Communication Link- Consideration, Calculation and Design. Power and Bandwidth Limitations and Budget.	10
4.	Modulation Techniques	Modulation and Demodulation Techniques. Performance Analysis- Noise and Bandwidth.	6
5.	Multiple Access	Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA) and Code Division Multiple Access (CDMA)	8

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6.	Different Communication Satellite Systems	VSAT. Navigational Satellites. Broadcasting Satellites. Remote Sensing Satellites. Low and Medium Earth Orbit Satellites. INSAT. INTELSAT.	5				
7.	Some Communication Satellite Applications	DBS TV. Multimedia Transmission Related Issues, Advantages& Bit Rates for Digital TV, HDTV, Bandwidth Considerations and Introduction to Compression Standards. Convergence of Communication, Introduction to IPTV.	4				
	"	Total number of Lectures	45				
Eval Com T1 T2 End TA TA Tota	uation Criteria ponents Semester Examination	Maximum Marks 20 20 35 25 (Attendance: 10 Marks, Assignment: 5 Marks, Presentatio 100	n: 10 Marks)				
Reco Refe	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)						
1.	T. Pratt, C.W. Bostian and J.E. Allnut, Satellite Communications, 2 Ed, John Wiley & Sons (Asia), 2003						
2.	Dennis Roddy, Satellite Communications, 4 Ed, Tata Mcgraw Hill, 2006						
3.	G. Maral & M. Bousquet, Satellite Communications Systems- Systems, Techniques and Technology, 4 Ed, John Wiley and Sons, 2002.						
4.	Richard Brice, Newness C	uide to Digital TV, 2Ed, 2003.					

Gerard O' Driscoll, Next Generation IPTV Services and Technologies, John Wiley & Sons, 2008

5.

Course Code	19B12EC411	Semester Even (specify Odd/Even)		<b>Semester</b> 8 <sup>th</sup> <b>Session</b> 2018 -2019 <b>Month from</b> Jan to May 2019		
Course Name	Interface IC Design f	or MEMS and Sensors				
Credits	03		<b>Contact Hours</b>		04	
Faculty (Names)	Coordinator(s)	ShivajiTyagi				
	Teacher(s) (Alphabetically)	ShivajiTyagi				

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Recall the basic principles involved in MEMS based sensors and CMOS process technology and find their application areas.	Remembering Level (C1)
CO2	Explain the electro-mechanical mechanisms involved & signal transduction modelling. Illustrate the problems involved in sensor interface.	Understanding Level (C2)
CO3	Choose and select the specifications needed for analog integrated circuits & systems.	Applying Level (C3)
CO4	Examine the techniques needed for low-frequency MEMS & sensors and the various issues involved in analog IC circuits.	Analyzing Level (C4)
CO5	Justify the various topologies on the basis of better performance and low cost solution.	Evaluating Level (C5)
CO6	Explore the performance of various analog cells through design and simulation using HSPICE circuit simulator.	Creating Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Sensor Technology, MEMS Resonators, Transduction techniques, MOS Amplifiers	MEMS Technology, MEMS based Resonators and Actuators - Modal and Harmonic Analysis, Micromachining - Surface, Bulk; Equivalent circuit analysis of MEMS Resonators, Actuation techniques - Electrostatic, electromagnetic, thermal analysis, Detection techniques- Capacitive, Piezoresistive; Single stage amplifiers –gain and bias considerations; Current Sources, Current mirrors, Cascade current mirrors; Frequency response of Amplifier CS Amplifer, Miller effect. Single-ended and Differential Operation, basic Differential Amplifier pair – DC, AC and Transient Analysis, Common-Mode Response	14
2.	Noise and Feedback in Analog Circuits and MEMS Resonators	Noise Characteristics, Thermal Noise, Flicker Noise, Representation of Noise in Circuits, Noise in Single Stage CS, CD, CG Amplifiers, Noise in Differential Pairs, Noise Bandwidth, MEMS Resonator Noise Analysis	06
3.	Feedback in Analog Circuits	Properties of Feedback Circuits, Feedback Topologies – Voltage-voltage, Current-voltage, Voltage-current, Current- current, Effect of Loading on Feedback Topologies	06
4.	Transimpedance	Closed loop stability of op-amp, Two stage opamp with	06

	A N	mplifiers for ano Devices	miller compensation, FD-OTA topologies, Various TIA topologies.				
5.	C. Fi	MOS Analog ilters	Classical design approach, Transfer functions and s-plane, switched-capacitor based filters, Gm-C filters	08			
6.	А	dditional Topics	ADC, DAC design Methodology for sensor based MEMS devices	06			
			Total number of Lectures	46			
Eval	uation C	riteria					
Com	ponents		Maximum Marks				
T1			20				
$\begin{bmatrix} T2 \\ T \end{bmatrix}$	<b>a</b> .	<b></b>	20				
End	Semester	Examination	35 25 (10(A)) 1 15(A) : (1)				
			25 (10(Attendance), 15(Assignment))				
lota	1		100				
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)							
1.	Philip A	Allen, D. Holberg, "O	CMOS Analog Circuit Design", 2 <sup>nd</sup> Edition, Oxford				
2.	BehazdRazavi, "The Design of Analog CMOS Integraaed Circuits", 2 <sup>nd</sup> edition, McGrawHill, 2016						
3.	S D Senturia, "Microsystem Design", 2 <sup>nd</sup> edition, Springer, 2001						
4.	NPTEI O	Course, "Analog IC	Design by Prof. Nagendra Krishnapura, IITM				
5.	NPTEl (	Course, "Micro and	Smart Systems" by IISc				

Course Code		19B12EC414		Semester Even (specify Odd/Even)		Semester 8 Session 2018 -2019 Month from Jan to May			018 -2019
Course Na	me	Natural Language processing with Deep Learning							
Credits			4		Contact H	Hours	3L+1	P	
Faculty (N	ames)	Coordinator(	<b>(s)</b>	B Suresh					
		Teacher(s) (Alphabeticall	ly)	B Suresh					
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
CO1	Understanding the problems associated with Natural language processing and recent technological developments.							nding )	
CO2	Applyi tasks.	ng deep learning	g appro	paches to improv	ve the perform	rmance N	LP	Applying	5
CO3	Develo which	op the basic conc can deal with NI	cepts of LP.	f python program	nming to N	NM mode	els	Applying	)
CO4	Analyz applica	ting performance	e of va	rious neural net	works in the	NLP		Analyzin (Level IV	ng 7)
Module No.	Title o Modul	f the le	Topics	in the Module					No. of Lectures for the module
1.	Introduction and Word VectorsWord2Vec - The Skip-Gram Model Efficient Estimation of Word Representations in Vector Space, Distributed Representations of Words and Phrases and their Compositionality5						5		
2.	Word2Vec - The Skip-Gram ModelEfficient Estimation of Word Representations in Vector Space Distributed Representations of Words and Phrases and their CompositionalityWord Vectors 2 and Word Senses						10		
3.	GloVe: Global Vectors for Word RepresentationImproving Distributional Similarity with Lessons Learned from Word Embeddings, Evaluation methods for unsupervised word embeddings, A Latent Variable Model Approach to PMI-based Word Embeddings,Linear Algebraic Structure of Word Senses, with Applications to Polysemy On the Dimensionality of Word Embedding. Word Window Classification, Neural Networks, and Matrix Calculus11						11		

4.	Backpropagation and Computation Graphs	Learning Representations by Backpropagating Errors Derivatives, Backpropagation, and Vectorization understand backprop Linguistic Structure: Dependency Parsing Incrementality in Deterministic Dependency Parsing A Fast and Accurate Dependency Parser using Neural Networks Dependency ParsingGlobally Normalized Transition-Based Neural Networks	9					
5.	N-gram Language Models	The Unreasonable Effectiveness of Recurrent Neural Networks Sequence Modeling: Recurrent and Recursive Neural Nets On Chomsky and the Two Cultures of Statistical Learning Vanishing Gradients and Fancy RNNs	10					
	Total number of Lectures 45							
Eval	uation Criteria							
Com	ponents	Maximum Marks						
T1		20						
T2 End 9	Somestor Examination	20						
	Semester Examination	25						
Tota	1	100						
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)								
1.	Learning in Natural Language Processing 1st ed. 2018 Edition by Li Deng (Editor), Yang Liu (Editor)							
2.	Neural Network Methods in Natural Language Processing (Synthesis Lectures on Human Language Technologies) Paperback – April 17, 2017 by Yoav Goldberg (Author), Graeme Hirst (Editor)							

3. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit 1st Edition, Kindle Edition by Steven Bird (Author), Ewan Klein (Author), Edward Loper (Author)

Course Co	urse Code19B12EC413Semester Even (specify Odd/Even)Semester 8 Month from		er 8 - S from J	Session 2018 -2019 Jan 2019			
Course Na	me	Convergence and Ne	xt Generation Ne	etworks			
Credits		4 Contact Hours 4					
Faculty (Names)		Coordinator(s)	Prakash Chandra Gupta				
		Teacher(s) (Alphabetically)	Prakash Chandra Gupta				
COURSE	OUTCO	OMES					COGNITIVE LEVELS
CO1	O1 Understand principles of multimedia, quality of service, network security and various signaling systems and their application session management				n	Applying Level (C3)	
CO2	To apply above concepts for developing the framework required for secure transport of multimedia with required quality of service.Analysis Level (C4)						Analysis Level (C4)
СОЗ	To able to analyze NGN architecture with application of QOS, security and signaling systems, and evaluate the current technology trends of network convergence.       Evaluation Level (C5)						Evaluation Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Convergence and NGN	Introduction to convergence in telecommunications, and evolution of new generation networks (NGN).	1
2.	Voice/Multimedia over IP Network	<ul> <li>(a) Audio/video digitization and compression, standard codecs.</li> <li>(b) RTP, RTCP, RTSP, streaming stored/live audio/video</li> <li>(c) QoS, RSVP, Differentiated service, Policy based QoS</li> <li>(d) PIM/IGMP protocols for multicasting</li> </ul>	10
3.	Network Security	<ul> <li>(a) Security basics</li> <li>(b) Security at IP layer, IPSec</li> <li>(c) Security at TCP layer, TLS</li> </ul>	7
4.	Signaling Protocols for Converged Networks	<ul> <li>(d) Session Initiation Protocol (SIP)</li> <li>(a) ITU-T H.323</li> <li>(b) SS7 Signaling protocol and its transport over IP.</li> <li>(c) Interworking between networks based on SIP and SS7, SIP and H.323, H.323 and SS7</li> </ul>	9
5.	Media Gateway Control & Softswitch	Separation of media and call control functions, softswitch architecture, media gateway control, MEGACO/H.248	2
6.	Next Generation Network	<ul> <li>(a) NGN architecture (ITU-T Y.2012)</li> <li>(b) IP Multimedia subsystem (IMS) functional architecture</li> <li>(c) IMS addressing</li> <li>(d) Discovery and session control</li> <li>(e) IMS services, emergency services</li> </ul>	9
7.	Fixed Mobile	(a) Overview of FMC, unified communications	2

Convergence	(b) Enabling technologies for FMC (GAN, Femtocell)	
(FMC) & Unified		
Communications		
	Total number of Lectures	40
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
ТА	25 Assignment 1 (5), Assignment 2 (5), Quiz (5), Attendan	ce (5),
	Participation (5)	
Total	100	

Reco Refe	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)						
1.	Hu Hanrahan, Network Convergence, John Wiley &Sons, 2007						
2.	Lingfen Sun, Is-HakaMkwawa, Emmanuel Jammeh, Emmanuel Ifeachor, <i>Guide to Voice and Video over</i> <i>IP For Fixed and Mobile Networks</i> , Springer, 2013						
3.	Daniels Collins, Carrier Grade Voice Over IP, MaGraw-Hill, 2003						
4.	Prakash C Gupta, Data Communications & Computer Networks, PHI, 2006						
5.	A. Ahson Syed, Ilyas Mohammad, Fixed Mobile Convergence Handbook, CRC Press.						
6.	Prakash C Gupta, Cryptography and Network Security, PHI, 2014						

Course Code		18B12HS815	5 Semester Even Semester 8 <sup>th</sup> Ses Month from Janua		Session 2 January 202	Session 2018 -2019 nuary 2019 to May 2019						
Course Name		QUALITY IS	QUALITY ISSUES IN ENGINEERING									
Credits			3		Contact <b>H</b>	Hours		3-(	)-0			
Faculty (N	ames)	Coordinato	r(s)	Dr. Santoshi Se	engupta							
		Teacher(s) (Alphabetica	ally)	Dr. Santoshi So	engupta							
COURSE	OUTC	OMES						COGNIT	IVE LEVELS			
C402-32.1	l Ap by cor	ply the concept understanding ntributions of k	ts of qua various ey gurus	lity within quali perspectives, his s in the field of q	ty managen torical evol uality	nent syste ution; and	ms 1	Apply Lev	vel (C3)			
C402-32.2	2 De and	termine the effe d double sampli	ectivene ing plan	ss of acceptance s and operating c	sampling u characteristi	sing sing c curves	le	Evaluate I	Level (C5)			
C402-32.3	De B lea fur	termine quality n concepts and action deployme	by emp process ent	loying a wide ra improvement te	nge of basic chniques su	c quality t the quality	ools, y	Evaluate I	Evaluate Level (C5)			
C402-32.4 Examine the impo awards, certificati			rtance of six sigma, various quality standards, Analons			Analyze L	yze Level (C4)					
Module No.	odule Title of the D. Module			Topics in the Module				No. of Lectures for the module				
1.	Funda Qualit	mentals of y	Perspectives and Definitions of Quality, Dimensions Of Quality for Product and Service, History of Quality, Phases of Quality Assurance, Alignment, Linkage, Reengineering, Contribution of Gurus – Shewhart, Deming, Ishikawa, Juran					6				
2.	Cost o Qualit Deplo	of Quality and y Function yment	Cost o House	of Quality, Vo Of Quality, QFI	ice Of Cu D Process	stomers:	Kano	's Model,	6			
3.	Basic Qualit	Tools of y	Check Flowe	sheets, Cause harts, Pareto Ana	and Effect alysis, Scatt	Diagrar er Diagra	ns, H ms, Rı	istograms, un Charts	9			
4.	4. Statistical Thinking And Applications Acceptance Sampling, Single Sampling Plan, Double Sampling Plan, Statistical Process Control, Specification And Control Limits, Control Charts For Attributes, Control Charts For Variables				9							
5.	Six Bench Lean	Sigma, marking and Concepts	Six S DMAI Metho Mudas	igma, Capabili C Process, I ds; JIT, Andon,	ty Of A Benchmarki Kanban, K	Process/ ng Mea aizen, Po	Produo ning, ka-Yo	ct/Service, Process, ke, 5-S, 7	9			
6.	Qualit	y Standards	ISO St	andards, MBNQ	A, RGNQA	A, Deming	Quality       Standards       ISO Standards, MBNQA, RGNQA, Deming Prize       3					

	and Awards						
Total num	42						
Evaluation	n Criteria						
Componen	its	Maximum Marks					
T1		20					
T2		20					
End Semes	ter Examination	35					
TA		25 (Project, Assignment, Case Study, Quiz, Oral Questions)					
Total		100					
<b>Becommanded Beading material:</b> Author(s) Title Edition Publisher Vegr of Publication etc. (Text books							

Reco Refe	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)					
1.	NVS Raju, Total Quality Management, 1 <sup>st</sup> Edition, Cengage Learning, 2014					
2.	Kanishka Bedi, Quality Management, 1 <sup>st</sup> Edition, Oxford University Press, 2006					
3.	D.H. Besterfield, Total Quality Management, Revised 3 <sup>rd</sup> Edition, Pearson Education, 2011					

Course Code		18B12NHS812		Semester Even (specify Odd/Even)		Semester 8Session20Month fromJan 2018 to		018 -2019 July 2018	
Course Name Soc		Social and Le	ocial and Legal Issues						
Credits			3		Contact Hours			3-(	)-0
Faculty (N	ames)	Coordinato	r(s)	Dr Swati Sharr	na				
		Teacher(s) (Alphabetica	ally)	Dr Swati Sharr	na				
CO Code	COUF	RSE OUTCON	AES					COGNIT	IVE LEVELS
C402-10.1	Demor individ	nstrate an unde luals and busin	rstandin esses.	g of social scien	ce and busi	ness law 1	to	Understand	ling Level (C2)
C402-10.2	Critica agreen	lly evaluate ho nents, rights an	w infor d obliga	mation technolog tions affects bus	gy, contract	ual ociety		Evaluating	g Level (C5)
C402-10.3	Analys	se legal implica	ations of	societal laws.				Analyzing	Level (C4)
C402-10.4	Develop acceptable attitudes issues related to technology,			with respect to system, informat	ethical cultition	ural and s	ocial	Applying I	Level (C3)
Module No.	Title o Modu	f the le	Topics	Topics in the Module			No. of Lectures for the module		
1.	Introd	uction	n Introduction to Social and Legal Issues				1		
2.	Social Impact	al Structure and social Structure Social Impact on Information system and Technology			6				
3.	Ethics		Business Ethics & Values, Professional Conduct, Code of ethics for an Engineer, Ethics in Bio-Tech.       6				6		
4.	Societa	ll Laws	Introd Consu	uction to Constit mer Protection A	tution, Righ Act,	t to inform	nation	,	8
5.	Busine	ss Laws	Contra	ict Act, Compan	y Act, Nego	otiable Ins	trume	nts Acts	8
6.	Intelleo Proper Cybers	ctual ty & space	Intelleo Copyri	ctual Property Is ight Law, Trade	sues:(What mark and I	is Intellec aw of Pat	ctual P tent	roperty ,	5
7.	Cyber and IT	Crime, Laws Act	Computer Crimes(Fraud and Embezzlement, Sabotage & Information Theft, Intruders, Hacking& Cracking), Computer Crime Laws, Digital Forgery, Cyber Terrorism, Wiretapping, IT Act8			8			
					Т	`otal num	ber of	f Lectures	42
Evaluation	Evaluation Criteria								
Componer T1 T2 End Semes	n <b>ts</b> ter Exar	nination	Maxim 20 20 35	um Marks					

ТА	25 (Assignment and Oral Viva)
Total	100

Reco Refe	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)						
1.	Albuquerque D, Business Ethics Principles and Practices, 1 <sup>st</sup> edition, Oxford University Press,2010						
2.	Baase,S, A Gift Of Fire Social, Legal, & Ethical Issues in Computing and Internet,2 <sup>nd</sup> edition Prentice Hall, US, 2006						
3.	Diwan,P. & Kapoor,S, Cyber And E-Commerce Laws with information Technology Act, & Rules,2 <sup>nd</sup> edition, Prakesh Publication House,Jaipur, 2000						
4	Gogna, P.P.S., A Text book of Business Law, 1st ed, , S Chand & Company LTD.2000						
5	Ghosh,B., Ethics in Management and Indian Ethos, 2 <sup>nd</sup> Edition, Vikas Publishing house,New Delhi, 2006						

Course Co	de	15B1NHS832	2	Semester EvenS(specify Odd/Even)N		Semeste Month 1	Semester VIII Session 2018-2019 Month from Jan - July		2018 -2019
Course Na	me	International	nternational Studies						
Credits			3		Contact Hours 3-		3-(	)-0	
Faculty (Names)		Coordinato	r(s)	Dr. Monica Chaudhary					
		Teacher(s) (Alphabetica	ully)	Dr. Monica Chaudhary					
CO Code	de COURSE OUTCOMES COGNITIVE LEVELS								
C402-8.1	Interpr	et the major se	curity is	ssues in the Eura	sia Region.			Unders	standing (C2)
C402-8.2	Compa major :	pare the developed and developing economies along with other Applyin or international economic concepts and institutions.					olying (C3)		
C402-8.3	Analyz techno	yze the major historic, economic, political, socio-cultural and Ana nological issues from a global perspective.					Ana	lyzing (C4)	
C402-8.4	Discuss India's relations with USA, Russia and China.         Understanding (C2)								
Module No.	Title o Modu	f the le	Topics	s in the Module					No. of Lectures for the module

			the module
1.	Introduction	Introduction	1
2.	Historical Aspects	<ul> <li>Feudalism, Socialism, communism, Capitalism,</li> <li>World War I</li> <li>World War II: Allies &amp; the world</li> <li>Current Power Centers</li> </ul>	12
3.	Global Markets	<ul> <li>The politics of trade</li> <li>Liberal market economies—The United States</li> <li>The rise of emerging markets—reaching where?</li> <li>WTO, Trading blocks, International treaties</li> </ul>	6
4.	Social-cultural	<ul> <li>Global Population, Migration</li> <li>Human Rights – Amnesty, UNO, Geneva Convention</li> <li>Environmental and Ethical Issues</li> <li>Communication &amp; Culture</li> </ul>	4
5.	Political	<ul> <li>International Relations: Terrorism, United Nations</li> <li>Current Issues in International Politics: China &amp; Sea Water, Israel – Palestine, Ukraine, European Union</li> <li>Warfare in the Modern World</li> </ul>	8
6.	Emerging Technologies	<ul> <li>Top 10 emerging technologies by World Economic Forum 2018</li> <li>Emerging health technologies by WHO</li> <li>Emerging technologies: options for the future</li> </ul>	5

7.	India	India • India's Relation with China, US, Russia					
	Great Indians Diaspora and their contributions						
	India: Futuristic View						
Total number of Lectures							
	Evaluation Criteria						
Componer	nts	Maximum Marks					
T1		20					
T2		20					
End Semes	End Semester Examination 35						
ТА		25 (Quiz 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.	M. Friedman, Chapters 1–3, 6, 10, and 12–13 in <i>Capitalism and Freedom: 40th Anniversary Edition</i> . University of Chicago Press, 2002.
2.	T. Oatley, International Political Economy (4th Edition) (Paperback). New York: Longman, 2010.
3.	J. Keegan, A History of Warfare, Vintage Books, New York, 1994.
4.	A. Sen, Development as Freedom, Anchor Books, New York, 1999.
5.	J.B. Stewart, "A Reporter at Large: Eight Days." The New Yorker, September 21, 2009.
6.	Top 5 Futuristic Technologies That Exist Today! https://www.youtube.com/watch?v=VUncbfJaf8Q
7.	A. Rawi, L. Alfaro, et al. "Bombardier: Canada vs. Brazil at The WTO." Harvard Business School Case. Harvard Business School Publishing. Case: 9-703-022, February 20, 2003.
8.	http://www.forbes.com/sites/carolkinseygoman/2011/11/28/how-culture-controls-communication/

Course Code		18B12PH811	l	Semester Even         Semester VIII Session           Month from January to Ju			2018 -2019 une		
Course Name Photonics an		Photonics and	d Applic	l Applications					
Credits			3		Contact H	lours		3	}
Faculty (N	ames)	Coordinato	r(s)	Navneet Kuma	r Sharma a	nd Anshu	Varsh	ney	
Teacher(s) (Alphabetic			ally)	Navneet Kuma	r Sharma a	nd Anshu	Varsh	ney	
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
C402-3.1	Recall in the g	the fundament generation of li	tal prope ight	erties of light and	l the proces	ses involv	ved	Remembe	ring (C1)
C402-3.2	Interpr	et the theory o	f fiber o	ptics				Understan	ding (C2)
C402-3.3	Apply techno	the fundament logy; make use	als of va of holo	arious nonlinear	optical effe pplications	cts in		Applying	(C3)
C402-3.4	Compa optical	are the operation detectors and	onal prin modula	ciples, character	istics and t	ade-offs	of	Analyzing	g (C4)
Module No.	dule     Title of the Module     Topics in the Module				No. of Lectures for the module				
1.	Lasers         Review of different types of laser systems. LEDs, Semiconductor lasers, Quantum well lasers, Q-switching and Mode locking in lasers.				8				
2.	2. Fiber Optics Numerical aperture, Step and graded index multimode fibers, attenuation and dispersion, modes in optical fibers. Single mode fiber, mode cutoff and mode field diameter. Connector and splice losses, Erbium doped fiber amplifier and Characterization techniques including OTDR			10					
3.	Photo	detectors	Semico	onductor photo d	letectors.				5
4.	• Optical Electronics Wave propagation in anisotropic media, Electro-optic effect: phase and amplitude modulation. Acousto-optic effect: modulators, deflectors and tunable filters, Magneto- optic effect: modulators				4				
5.	Optica	l devices	Electro optical	o-optical device, device, Optical	Acousto-op Communic	otical devi ation.	ice, M	agneto-	2
6.	. Nonlinear Optics SHG, Sum and Difference frequency generation, parametric amplification, wavelength converters, Self focusing with lasers.			6					
7.	Hologi	caphy	Record hologr	ling and Reprod aphy.	uction of H	ologram,	Applic	cations of	4
8.	8.     Applications of Photons in Memory devices     CD, VCD, DVD.     1			1					
					T	'otal num	ber of	f Lectures	40

<b>Evaluation Criteria</b>	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
ТА	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	100

Reco Refe	<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)					
1.	R. P. Khare, Fiber Optics and Optoelectronics, Oxford University Press.					
2.	A. K. Ghatak and K. Thyagarajan, <i>Optical Electronics</i> , Cambridge university Press.					
3.	<b>3.</b> A. K. Ghatak and K. Thyagarajan, <i>An Introduction to Fiber Optics</i> , Cambridge university Press.					
4.	B. B. Laud, Lasers and Nonlinear Optics, New Age International.					

Course Code	18B12PH812	Semester: Even		Semester: VIII Session : 2018 -2019 Month from: January to June		
Course Name	Astrophysics					
Credits	3		Contact Hours 3			
Faculty (Names)	Coordinator(s)	Prof.Anirban P	n Pathak and Dr. Sandeep Chhoker			
	Teacher(s) (Alphabetically)	Anirban Pathak and Sandeep Chokker				

COURSE	OUTCOMES	COGNITIVE LEVELS
C402-4.1	Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units	Remembering (C1)
C402-4.2	Explain the models of universe, ideas of stellar astrophysics, life cycles of stars, physical principles that rules galaxies, and general theory of relativity	Understanding (C2)
C402-4.3	Apply mathematical principles and laws of physics to solve problems related to astrophysical systems	Applying (C3)
C402-4.4	Compare different models of universe and decide which one is logically acceptable and why	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1	Introduction to Astrophysics	Historical development of astrophysics (from mythology to contemporary astrophysics), Mass, length and time scales in astrophysics, sources of astronomical information (effect of discovery of spectroscopes and photography), astronomy in different bands of electromagnetic radiation (e.g. Optical astronomy, infra-red astronomy radio astronomy, X-ray astronomy. Gamma-ray astronomy etc. with specific mention of Hubble space telescope). Kirchoff's law, Doppler effect and Hubble's law.	8
2.	Stellar Astrophysics	Classification and nomenclature of stars. Basic equations of stellar structure, main sequence, red giants and white dwarfs, HR diagram, stellar evolution, supernovae, extra solar planets.	8
3.	Death of a star	End states of stellar collapse: degeneracy pressure of a Fermi gas, structure of white dwarfs, Chandrasekhar mass limit, neutron stars pulsars and black holes.	6
4.	Our galaxy	The shape and size of Milky way and its interstellar mater	2
5.	Extragalactic astrophysics	Normal galaxies, active galaxies, cluster of galaxies, large- scale distribution of galaxies.	6
6.	GTR and Models of Universe	Qualitative idea of general theory of relativity (without using tensor calculus) and its implications. Different models of universe. Specific attention to the ideas	6

	related to big bang, cosmological constants, dark matter and dark energy.					
7.		Astrobiology	Drake equation and related questions.	2		
8.		Conclusion	Review of the present status of Astrophysics and open questions.	2		
	40					
Eval	uation	Criteria				
Com	ponent	ts	Maximum Marks			
T1			20			
T2			20			
End	Semeste	er Examination	35			
TA			25 [2 Quizes (10 M), Attendance (10 M) and Class performan	nce (5 M)]		
Tota	1		100			
·						
Reco Refe	mmen rence B	ded Reading materia looks, Journals, Repo	<b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format)	( Text books,		
1.	Astrop	physics for Physicists	, Arnab Rai Choudhuri, Cambridge University Press, Delhi, 20	10.		
2.	Astrophysics: Stars and Galaxies, K D Abhyankar, University Press, Hyderabad, 2009.					
3.	Facts and Speculations in Cosmology, J V Narlikar and G Burbidge, Cambridge University Press, Delhi, 2009.					
4.	The Cosmic Century, Malcolm Longair, Cambridge University Press, Cambridge, 2006.					
5.	An Int	troduction to Astroph	ysics, BaidyanathBasu, Prentice Hall of India, Delhi 1997.			
6.	6. Fundamentals of Equations of State, S. Eliezer, A Ghatak and Heinrich Hora, World Scientific, Singapore, 2002. Only Chapter 15.					

Subject Code	15B1NPH831	Sem	ester: Even	Semester Even Session 2018-19 Month from January to June			
Subject Name	Integrated Optics a	nd Applica	ations	I <u></u>			
Credits	3	Cont	Contact Hours 3				
Faculty (Names	coordinator(s)	Dr A	Amit Verma	r <u></u>			
	Teacher(s) (Alphabetically	) Dr A	Amit Verma				
COURSE OUT	COMES				COGNITIV	E LEVELS	
C402-26.1	Recall Integrated communication and	optical c photonics	ircuits and their s.	applications in	Remembering	g (C1)	
C402-26.2	Explain Elements of detectors, wavegui communications.	of optics, 1 des and th	ray transformation heir applications	, optical sources, in photonics and	Understandin	g (C2)	
C402-26.3	Demonstrate the us solving various pr integrated circuits.	se of Matro oblems ro	ix optics and Fou elated to wavegu	rier transform in ides and optical	Applying (C3	3)	
C402-26.4	Prove and estima physical and mat optical circuits and	ate solution of numerical problems using Evaluating (C5) thematical concepts involved with various l switches.					
C402-26.5	Design of optical of applications.	ircuits of desired output for communication Creating			ng (C6)		
Module No.	Title of the Module	Topics in	n the Module			No. of Lectures for the module	
1.	Matrix Optics	Introduct ray trans optical c Guides).	oduction, Postulates of Ray Optics, Matrix optics; The transfer Matrix, Matrices of some simple, cascaded cal components and Periodic optical systems (Light des)				
2.	Fourier Optics	Fourier Exponen Convolut frequenc filters.	Fourier series and analysis of periodic functions, Exponential form of Fourier series and Fourier transform Convolution and applications in image processing; frequency filtering, low pass, high pass and band pass filters.				
3.	Lasers	Lasers; threshold condition, resonator wave guides and Types of Lasers, Laser diodes; Fabry-Perot lasers. DFB, DBR lasers, ultrafast optics and Applications.7					
4.	Optical waveguides	Optical waveguid Diffraction compone commun	Optical waveguides and fibers, Planar and strip       7         waveguides, Amplifiers (EDFA), Directional couplers,       7         Diffraction Grating couplers, Grating-assisted optical components. Fiber sensors, fiber optic network and communication.       7				
5.	Micro and nano lithography	Lithogra Nanosca resonator	phy. Etching, le waveguide, mi r and applications.	Metallization, cro-ring resonator	Packaging, , micro-disk	4	

6.	Photonic integrated circuits	Integrated optical Devices; Design and Processing Technology Photonic switches, PIC (Photonic Integrated Circuits), Photonic crystal cavity, plasmonic waveguide based devices, NRI (negative refractive index) Optics,				
	perfect lens, near-field scanning optical microsco (NSOM) and Applications.					
		Total number of Lectures	40			
Evaluation Crit	teria					
Components T1 T2 End Semester E2 TA Total	Ma 20 20 xamination 21 10	aximum Marks 0 0 5 5 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 00	5 M)]			
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)						
1.	R. P. Khare, Fiber Optics and Optoelectronics, Oxford University Press.					
2.	A. K. Ghatak and K. Thyagarajan, <i>Optical Electronics</i> , Cambridge university Press.					
3.	A. K. Ghatak and K. Thyagarajan, An Introduction to Fiber Optics, Cambridge university Press.					
4.	B. B. Laud, Lasers and Nonlinear Optics, New Age International.					

Псстиге-мізе Бісакир						
<b>Course Code</b>	13B1NHS831	Semester Even		Semeste	r Vl	<b>III Session</b> 2018 - 2019
		Month fro		rom J	an 2019 to June2019	
Course Name	ORGANIZATION	AL PSYCHOLO	DGY			
Credits	3	Cont		Hours		3-0-0
Faculty (Names	coordinator(s)	Dr Nilu Choudhary				
	Teacher(s) (Alphabetically)	Dr Nilu Choudhary				
COURSE OUTCOMES COGNITIVE LEVEL					COGNITIVE LEVELS	
C402-29.1	Demonstrate advanced including a discussion o	Demonstrate advanced knowledge in organizational psychology including a discussion of its historical origins and development.			gy, nt.	Understanding Level(C2)
	Explain the psycholog	ogical principles underlying job analysis,			Understanding Level(C2)	

C402-29.2	Explain the psychological principles underlying job analysis, selection process, and performance appraisal.	Understanding Level(C2)
C402-29.3	Evaluate critically the nature of leadership and its role and development within organizations	Evaluating Level(C5)
C402-29.4	Analyze the impact of social, ethical, cultural economic and political influences on organizational behavior in local, national and global communities	Analyzing level(C4)
C402-29.5	Analyze critically the conceptual and theoretical frameworks relating to organizational psychology.	Analyzing Level(C4)
C402-29.6	Creates a learning environment that promotes respect, collaboration, productive group interaction and creates new opportunities for development and exploration.	Creating Level(C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Meaning and Scope of Organizational Psychology	2
2.	Origins of Organizational Psychology	Scientific Management, The Hawthorne Studies and the Human Relations Approach to Management and Ergonomics	7
3.	Job Analysis and Job Evaluation	Business ethics & Organizing and describing the tasks involved in a job and determining the position's monetary value,	4
4.	Personnel Selection	Matching the best person to each job using, KASo's testing, interviews, work sample exercises	4
5.	Training ,	On the job, Off the job training, Orientation, formal training, and mentoring.	3
6.	Performance Appraisal	Objective and subjective measures, Sources of Bias in Performance Ratings, 360-Degree Feedback, The Importance of Fairness, Other Performance Measures: Thinking Outside the Box and Organizational Citizenship Behaviour (OCB)	4
7.	Motivation, Approaches to	The "Japanese" Management Style, Theory X and Theory Y, Strengths-Based Management	6

	Management:, Leadership			
8	LearningTraditional and learning Organization, EmployeeOrganizationCommitment, The Meaning of Work		4	
9	Organizational Culture	Types Organizational Culture, Factors Contributing to Positive Organizational Culture, Toxic Factors in the Workplace,	4	
10	Modern Organization Design	Organizational Design, Hollow, Modular, network design	2	
11	Stress at Work	Job Stress at Work, Managing Job Stress	2	
		Total number of Lectures	42	
Eval	uation Criteria			
Com T1 T2 End 3 TA Tota	ponents Semester Examination	Maximum Marks 20 20 35 25 (Assignments, Quiz) 100		
Reco Refe	ommended Reading materia rence Books, Journals, Repo	<b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format)	( Text books,	
1.	Blum, N.L., & Naylor, J.C.	"Industrial Psychology - its theoretical and social foundation",	Cbs, 2004	
2.	Dunnette, M. D., & Hough Psychology Press, 1992	, L. M. "Handbook of Industrial and Organizational Psychology	", Consulting	
3.	Griffin, R. W. & Moorhea Western Cengage Learning	d G. "Organizational Behaviour: Managing People and Organi , 2009	zations", South-	
4.	Luthans, F. "Organizational Behaviour", McGraw-Hill/Irwin, 2011			
5	Robbins, S. P. "Organizational Behaviour", Prentice Hall, 2009			
6	Schultz, D. P., & Schultz, S. P. "Psychology and Industry Today: An Introduction to Industrial and Organizational Psychology", MacMillan Co., 1992			
7	Journal of Occupational and Organizational Psychology, The British Psychological Society			
8	International Journal of Org	ganization Theory & Behavior, Pracedemics Press		
9	Work & Stress: An Interna	tional Journal of Work, Health and Organizations, Routledge		

Course Code	18B12HS814	Semester Even		Semester VIII Session 2018 -2019 Month from Jan 2019 to June 2019		
Course Name	KNOWLEDGE MAI	KNOWLEDGE MANAGEMENT				
Credits	3		Contact Hours 3-0-0		3-0-0	
Faculty (Names)	Coordinator(s)	Dr. Anshu Ban	Janwari			
	Teacher(s) (Alphabetically)	Dr. Anshu Banwari				

COURSE OUTC	COGNITIVE LEVELS	
C402-30.1	Demonstrate the way knowledge is embedded in today's organization and behavioral aspects involved in managing it	Understanding Level (C2)
C402-30.2	Compare and contrast different methods to preserve, nurture, share and manage knowledge	Understanding Level (C2)
C402-30.3	Identify appropriate methods for knowledge integration to gain competitive advantage	Applying Level (C3)
C402-30.4	Identify the legal ramifications arising from knowledge sharing and an insight into the ethical concerns faced by individuals and organizations	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Knowledge Management	Cognition and Knowledge Management, Data, Information and Knowledge, Types of Knowledge, Reasoning and Heuristics, Expert Knowledge, Human thinking and Learning, Knowledge Management myths	4
2.	Life Cycle of a knowledge Management System	Challenges in building Knowledge Management Systems, Conventional V/S Knowledge Management System Lifecycle, Knowledge Management System Life Cycle, System Justification, Role of Rapid Prototyping, Selecting an expert, Role of Knowledge developer	6
3.	Knowledge Creation and Knowledge Architecture	Models of Knowledge Creation and Transformation, Knowledge Architecture, The people Core, Identifying Knowledge centers, The technical core	5
4.	Capturing Tacit Knowledge	Evaluating the expert, Developing a Relationship with expert, Fuzzy reasoning and the quality of Knowledge capture, Interview as a tool, Knowledge capture techniques	6
5.	Knowledge	Codification Tools and Procedures, The knowledge	6

	Codification and System Implementation	Developer's Skill set, Quality assurance, Approaches to Logical testing and Acceptance testing, Issues related to deployment		
6.	Knowledge Transfer and Knowledge Sharing	Transfer strategies, Inhibitors of Knowledge transfer, Role of Internet in Knowledge Transfer	5	
7.	Managing Knowledge Workers	Business Roles in the Learning Organizations, Work adjustment and the Knowledge Worker, Technology and the Knowledge worker, Role of the CKO, Managing Considerations, Managing Knowledge Projects	5	
8.	Ethical, Legal and Managerial Issues	Knowledge Owners, Legal Issues, Ethical Decision cycle, Major threats to Ethics, The Privacy factor	5	
Total num	ber of Lectures		42	
Evaluation	n Criteria			
Componer	nts	Maximum Marks		
T1		20		
T2		20		
End Semester Examination		35		
ТА		25 (Project, Oral questions, Assignment)		
Total		100		
Bacommo	ndad Raading mat	arial: Author(s) Title Edition Publisher Vear of Publication etc.	(Text books	

Rec	ecommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books,				
Ref	erence Books, Journals, Reports, Websites etc. in the IEEE format)				
1	<b>D. Hislop,</b> Knowledge Management in Organizations, Oxford University Press, 2013				
2.	E. M. Awad and H. M. Ghaziri, Knowledge Management, Pearson Education, 2007				
3.	<b>S. Warier</b> , Knowledge Management, Vikas Publishing House, 2011				

Course Code	18B12BT415	Semester Even (specify Odd/Even)		Semeste Month f	er VIII f <b>rom</b> Jan	Session uary-June	2018 -2019
Course Name	Intellectual Property Rights and Bioethics						
Credits	3	Contact Ho		Iours	3		
Faculty (Names)	Coordinator(s)	1. Prof. S Krishna Sundari					
	Teacher(s) (Alphabetically)	1. Prof. S	Krishna Su	ındari			

COURSE O	COGNITIVE LEVELS	
C402-14.1	Recall National and International IP rules and Agreements	Remember Level(C1)
C402-14.2	Summarize various aspects of Intellectual Property Rights in context with technological advancements	Understand Level(C2)
C402-14.3	Utilize different patent search engines and search patent literature in speciality domains	Apply Level(C3)
C402-14.4	Identify appropriate guidelines related to engineering, professional, and biotechnology research ethics	Apply Level(C3)
C402-14.5	Survey and classify patents, make a report and present the IPR status in different fields.	Analyze Level(C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Intellectual Property Rights	Different forms of Intellectual Property Rights - their Relevance, Importance to Industry, Academia, Role of IPRs in biotechnology, Patent Terminology: Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications, Trade secrets, non-disclosure agreements, Patent Life and Geographical Boundaries	4
2.	International organizations & IPR	Overview of WTO, TRIPS, WIPO, GATT, International conventions, Trade agreements, Implication of TRIPS for developing countries	3
3.	Process involved in Patenting, Patent Search	Procedural steps in patenting, Process of filing, PCT application, pre-grant & post-grant opposition, PCT and Patent harmonization including Sui-generis system, Patent Search methods, Patent Databases & Libraries, online tools, Country-wise patent searches (USPTO, EPO, India etc.), patent mapping	4
4.	IPR in Agriculture Technology & Biotechnology	Basic features of Indian Plant Varieties Protection & Farmer's Rights Act, UPOV, Invention/ Discovery, Patentable subject matter, Generics, Compulsory Licensing, Exclusive Marketing Rights (EMR), Bolar provision, Bayh- Dole act, Second medical use	4

5.	5. Traditional Knowledge and Intellectual Property Rights		TraditionalThe importance of Traditional Knowledge (TK) forKnowledge anddeveloping nations, protecting TK, The local, national andIntellectualglobal dimensions of the issues in TK and IPRs, TraditionalProperty RightsMedicine & IP Protection, Folklore, Patenting of HealthFoods: Case studies			
6.	Introduction to Bioethics		Need of bioethics, applications and issues related to Bioethics, Social and cultural issues	2		
7.	7.Bioethics & Biodiversity		Conserving natural Biodiversity, convention on protecting Biodiversity, Protocols in exchanging Biological material across borders	2		
8.		Bioethics & GMO's	Issues and concerns pertaining to Genetically modified foods & food crops, Organisms and their possible health implications and mixing up with the gene-pool	3		
9.		Bioethics in Medicine	Protocols of ethical concerns related to prenatal diagnosis, gene therapy, Organ transplantation, Xenotransplantation, ethics in patient care, Informed consent	7		
10.		Bioethics & Cloning	Permissions and Procedures in Animal Cloning, Human cloning, Risks and hopes	3		
11.		Bioethics in Research	Stem cell research, Human Genome Project, Use of animals in research, human volunteers for Clinical research, Studies on Ethnic races	5		
12.		Ethics in Profession	Ethics related to professional streams, engineering	2		
			Total number of Lectures	42		
Eval Com T1 T2 End TA TA Tota	uation ponen Semes l	<b>Criteria</b> Its ter Examination	Maximum Marks 20 20 35 25 (Assignments, Attendance) 100			
Reco Refe	mmer rence l	nded Reading materia Books, Journals, Repor	<b>l:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ts, Websites etc. in the IEEE format)	( Text books,		
1.	"Bio	ethics & Biosafety" by	Sateesh MK, IK International publications, 2008			
2.	USPTO Web Patent Databases at: www.uspto.gov/patft					
3.	Government of India's Patents Website: patinfo.nic.in					
4.	Intellectual property India: www.ipindia.nic.in					
5.	"Indian Patent Law : Legal and Business Implications" by AjitParulekar, Sarita D'Souza Macmillan India publication, 2006					
6.	"Agr and C	iculture and Intellectua Carlson, G.A. Universit	al Property Rights", edited by: Santaniello,V., Evenson, R.E., Z ty Press publication, 2003	ilberman, D.		
7	Research papers and Reports provided from time to time					

Course Code		19B12HS814	ŀ	Semester (specify Odd/Even):Even		Semester: 8 <sup>th</sup> Session: 2018 -2019 Month from: January 19 –June 19			
Course Name		Digital Tran	Digital Transformation in Financial Services						
Credits			3		Contact I	lours	3-(	)-0	
Faculty (N	ames)	Coordinato	r(s)	Dr.Sakshi Vars	shney				
		Teacher(s) (Alphabetica	ally)	Dr.Sakshi Vars	shney				
COURSE	OUTCO	OMES						COGNITIVE LEVELS	
C402-31.1	Outlin	e the changes	that infl	uence the financ	ial sector in	digital ag	ge	Understand (Level 2)	
C402-31.2	Evalua techno	te the key diffe logy managem	erences	between tradition the impact it has	nal business s on busines	s manager s models	nent and	Evaluating (Level 5)	
C402-31.3	Analyz	ze the new deve	elopmer	nts in Financial T	Technology	in bankin	g sector.	Analyzing (Level 4)	
C402-31.4	Analyz	ze Consumer B	ehavior	s & digital disruj	ptions in In	surance		Analyzing (Level 4)	
C402-31.5	Evalua techno	Evaluate the limits, risks and broader policy and social implications of digital technology.							
C402-31.6	Organ digital	ising for Digita filing of incon	al Innov ne tax.	ation and Apply	the know	ledge of in	ncome tax by	Applying (Level 3)	
Module	Title o	of the	Tonics	s in the Module				No. of	
No.	Modu	le	ropic					Lectures for the module	
1.	Introduction Fin Tra			ncial services, Digitization, Digitalization, Digital asformation, digital tools in finance, importance and s. CASE STUDY OF BNP Paribus			04		
2.	Digital Payment Electronic System Electronic Electronic Advantag			onic commerce, erce, Categories onic wallets, Sm tages and Disady	nic commerce, Advantages & Disadvantages of e cce, Categories of e commerce, E payment systems, nic wallets, Smart Cards, credit cards, debit cards, ages and Disadvantages			04	
3.	Digitization in Banking: its types, evolution of e banking ,otp, payment mechanisms, RTGS,NEFT, AEPS, UPI, POS, Digital wallets.					06			
4.	BusinessModelsRevenue stream Distribution strategyPartnership strategyforDigitaltechnology ImplementationFinancial Services				05				
5.	ConsumerAnalysBehaviorsinDigital Economy			sis of behavior of financial service user, financial e provider, Principles of behavioral finance,			e user, financial nance,	05	
6.	Digital in Insu	Disruptions arance	Digital Insura	l Changes in nce	Life Insu	rance, H	ealth & Other	06	
7.	Digital Service	Financial es Risk and	Strateg	gic Risk, Regula	tory, Operation	ational Ri	sk, Technology,	08	

	its Management						
8.	Digital/E-Income Tax Filing	Income tax filing, Issues related and suggestions & Organising for digital Innovation	04				
Total number of Lectures							
Eval	uation Criteria						
Com	ponents	Maximum Marks					
T1 T2		20					
IZ End	Semester Examination	20					
TA	Semester Examination	25 (Project, Presentation, Attendance)					
Tota	l	100					
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)							
1.	1.Scardovi C., Transformation in Investment Management. In: Digital Transformation in Financial Services. Springer, Cham ,2017						
2.	2. OECD (2018), Financial Markets, Insurance and Private Pensions: Digitalisation and Finance						
3.	Digital Financial Service Bank, Africa, 2019. Acc https://www.ifc.org/wps/ saharan+africa/resources	es and Risk Management, International Financial Corporati essed on 2019(Online).Available: /wcm/connect/regionext_content/ifc_external_corporate /handbook-dfs-rm	on, World _site/sub-				

# Lecture-wise Breakup

Course Code		18B12MA81	1	Semester Eve	n <b>Semester</b> VIII <b>Month from</b> Jan		<b>Session</b> 2018 -2019 2019 to June 2019			
Course Na	me	FUZZY OPT	IMIZATION AND DECISION MAKING							
Credits		3			Contact <b>H</b>	Iours	3-0-0			
		Coordinato	r(s)	Dr. AMIT SRI	VASTAVA		J			
Faculty (Names) Teacher(s) (Alphabetica			ally)	Dr. AMIT SRIVASTAVA						
COURSE	OUT	COMES						COGN LEVE	NITIVE LS	
C402-24.1	E	Explain the conce	pt of fuz	zy sets and fuzz	y numbers.			Unders level(C	standing 22)	
C402-24.2	E	Explain various fu	ızzy and	generalized fuz	zy operation	18.		Unders level(C	standing C2)	
C402-24.3	A	Apply the concept	t of fuzz	y relations and a	pproximate	reasonin	g.	Apply	level(C3)	
C402-24.4 Apply the concept decision making p			t of fuzzy sets and their generalizations in various Erocesses.					Evalua	Evaluate level(C5)	
C402-24.5	A p	Apply various ran problems.	king techniques in solving fuzzy transportation				Apply	Apply level(C3)		
Module No.	Title Moc	e of the dule	Topics	s in the Module					No. of Lectures for the module	
1.	Fuzz fuzz	zy sets and zy numbers.	Definition of Fuzzy Set, Operations with fuzzy numbers. Triangular Fuzzy Numbers, Bell Shaped Fuzzy Numbers, Fuzzy Numbers with a Flat, Trapezoidal fuzzy Numbers, Piecewise – Quadratic Fuzzy Numbers with a Flat.					ers. bers, pers,	7	
2. Fuzzy and generalized fuzzy operations.		Addition and Subtraction of Fuzzy Numbers, Multiplication of Fuzzy numbers, Distance between Triangular Fuzzy Numbers, Fuzzy Operations in the set of integers, Distance between Triangular Fuzzy Numbers, Fuzzy Numbers with a Maximum, Fuzzy Numbers in the set of Integers, Fuzzy Numbers of Dimension Two, Definition of Fuzzy Set, Basic Operations of Fuzzy Sets.				7				
3.	Fuzz appr rease	zy relations and coximate oning.	Fuzzy Produc Max C Relatic	y Relations, Operations in Fuzzy Relations, Direct uct, Projections of Fuzzy Relation, Max-Min and Min- Compositions, Properties of Fuzzy Relations, Fuzzy ions and Approximate reasoning.					8	

4.	Decision making in	Decision making in a Fuzzy Environment, Individual	10					
	fuzzy environment.	Decision Making, Multiperson Decision Making,						
		Multicriteria decision Making, Multistage decision making,						
		Fuzzy Zero-Based Budgeting, Fuzzy Averaging for						
		Decision Making.						
5.	Ranking techniques	Fuzzy Ranking methods, Fuzzy Linear Programming,	10					
	in fuzzy	Fuzzy Transportation, Basic Definitions Associated with						
	transportation	Fuzzy Transportation, Solution of Fuzzy Transportation						
	problems.	Problem.						
Tota	l number of Lectures		42					
Eval	uation Criteria							
Com	ponents	Maximum Marks						
T1		20						
T2		20						
End	Semester Examination	35						
TA		25 (Quiz, Assignments, Tutorials)						
Tota	l	100						
Reco	ommended Reading materi	al: Author(s), Title, Edition, Publisher, Year of Publication etc.	( Text books,					
Refe	rence Books, Journals, Repo	rts, Websites etc. in the IEEE format)						
1	Bhargava, A. K., Fuzzy Se	et Theory, Fuzzy Logic and Their Applications, S. Chand & Co	mpany Pvt.					
1.	Ltd., 2013.							
2	Zimmermann, H. J., Fuzzy Set Theory and its Applications, 4 <sup>th</sup> Edition, Allied Publishers, New De							
<u>∠.</u>	1991.							
3.	Ross, T.J., Fuzzy logic wit	h engineering applications, 2 <sup>nd</sup> Edition, John Wiley and Sons, I	_td, 2004.					
4.	Baczynski, M. and Jayara	am, B., Fuzzy Implications, Springer Verlag, Heidelberg, 2008.						
5.	Klir, G. J. & Yuan, B., Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall NJ, 1995.							

# Lecture-wise Breakup

Course Code	19B12MA811	Semester: Even		Semester VIII Session 2018-2019 Month from: January 2019- June 2019		
Course Name	Mathematics in Finance					
Credits 3			Contact Hours		3-0-0	

Faculty (Names)	Coordinator(s)	Dr. Dinesh C. S. Bisht
	Teacher(s) (Alphabetically)	Dr. Dinesh C. S. Bisht

COURSE	OUTCOMES	COGNITIVE LEVELS
CO403- 22.1	Explain the basics of one period model and representation of securities by vectors and matrices.	Understanding Level (C2)
CO403- 22.2	Apply the complete hedging formula for portfolio selection and replicating portfolios.	Applying Level (C3)
CO403- 22.3	Understand the concept of arbitrage and pricing in one period model and apply the arbitrage theorem for incomplete market.	Applying Level (C3)
CO403- 22.4	Apply numerical techniques for optimal portfolio selection in incomplete markets.	Applying Level (C3)
CO403- 22.5	Apply Fourier transform for option pricing and fast Fourier transform for fast pricing.	Applying Level (C3)

Module	Title of the	Topics in the Module	No. of
No.	Module		Lectures for
			the module
1.	The Simplest	One-Period Finite State Model, Securities and Their Par-	12
	Model of Financial	Offs, Securities as Vectors, Operations on Securities, The	
	Markets	Matrix as a Collection of Securities ,Matrix Multiplication	
		and portfolios, Systems of Equations and Hedging, Linear	
		Independence and Red	
		undant Securities, The Structure of the Marketed Subspace,	
		The Identity Matrix and Arrow-Debreu Securities,	
		Complete Market Hedging Formula.	
2.	Arbitrage and	Hedging with Redundant Securities and Incomplete Market,	10
	Pricing in the One-	Geometric Interpretation of the Best Hedge, Minimizing the	
	Period Model	Expected Squared Replication Error, Numerical Stability of	
		Least Squares, Asset Prices, Returns and Portfolio Units,	

		Arbitrage, State Prices and the Arbitrage Theorem, No-				
		Arbitrage Pricing, State Prices and Asset Returns, Asset				
		Pricing Duality.				
3.	Numerical	Sensitivity Analysis of Portfolio Decisions with the CRRA	10			
	Techniques	Utility, Approximately Optimal Solution, Newton's				
		Algorithm for Optimal Investment with CRRA Utility,				
		Optimal CRRA Investment Using Empirical Return				
		Distribution				
4.	Fast Fourier	Introduction to Complex Numbers and the Fourier	10			
	Transform	Transform, Discrete Fourier Transform (DFT), Fast Pricing				
		via the Fast Fourier Transform (FFT).				
Total num	ber of Lectures		42			
Evaluation	n Criteria					
Componer	nts	Maximum Marks				
T1		20				
T2		20				
End Semester Examination		35				
ТА		25 (Quiz and Assignments)				
Total		100				

Reco	Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books,						
Refe	Reference Books, Journals, Reports, Websites etc. in the IEEE format)						
	Cerny, A., Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University						
1.	Press.2009.						
	Pliska, S. R., Introduction to Mathematical Finance: Discrete Time Models, Blackwell Publishers Inc.						
<u>∠.</u>	2002.						
3.	Chakravarty, S. K., Financial Mathematics. New Age International Pub. 2011.						

# Lecture-wise Breakup

Course Code		16B1NMA83	31	Semester Even (specify Odd/Even)		Semester VIII Session 2018-2019 Month from January 2019 to June 2019			2018-2019 )19 to June
Course Na	me	Optimization	Technic	ques					
Credits		3		C	ontact I	Iours	3-0-0	)	
Faculty (N	ames)	Coordinato	r(s)	Prof. A. K. Aggar	wal				
		Teacher(s) (Alphabetica	ally)	Prof. A. K. Aggar	wal				
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
After pursu	ing the	above mention	ed cours	se, the students will	be able	to:			
C402-2.1	apply g progra	generalized, rev mming probler	vised an ns (LPP	d dual simplex met ).	hod for l	inear		Applying	Level (C3)
C402-2.2	apply g and mi	graphical, algel xed strategy p	braic and roblems	d linear programmi in game theory.	ng techn	iques for	pure	Applying	Level (C3)
C402-2.3	classif	y and solve the	e probler	ns on queuing and	inventor	y models.		Analyzing	g Level (C4)
C402-2.4	solve a	and analyze the	e networ	k scheduling and se	equencin	g problen	ns.	Analyzing	g Level (C4)
C402-2.5	make use of dynamic programming technique to solve complex linear programming problems. Applying L							Level (C3)	
C402-2.6	determ	ine numerical	solution	of nonlinear multi	dimensio	onal probl	lems.	Evaluating	g Level (C5)
Module No.	Title o Modu	f the le	Topics	s in the Module				<u> </u>	No. of Lectures for the module
1.	Reviev Progra	v of Linear mming	Convex sets, Linear Programming Problems (LPP),08graphical and simplex method, Big-M method, Two phase08method, generalized simplex method, revised simplex08method, Duality theory, dual simplex method.08						08
2.	Game TheoryRectangular Games, Minmax Theorem, Graphical Solution of 2×n, 3×n, m×2, m×3 and mxn Games, Reduction to Linear Programming Problems.06						06		
3.	Queuing Theory & Inventory Model:Introduction, Steady-State Solutions of Markovian Queuing Models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited space, M/G/1, Inventory Models.06							06	
4.	Sequer Schedu	ncing & 1ling	Proces	sing of Jobs throug	h Machi	nes, CPM	f and P	ERT.	06
5.	Dynan Progra	nic mming	Discre <sup>-</sup> Illustra	te and Continuous Intions.	Dynamic	e Program	nming,	Simple	06

6.	Nonlinear	Unimodal function, One Dimensional minimization	08					
	Programming problem, Newton's Method Golden Section, Fibonacci							
		Search, Bisection, Steepest Descent Method,						
		Multidimensional Newton's method.						
		Total number of Lectures	40					
Eval	Evaluation Criteria							
Com	ponents	Maximum Marks						
T1		20						
T2 20								
End Semester Examination 35								
TA		25 (Quiz, Assignments)						
Tota	1	100						
Reco	mmended Reading mate	rial: Author(s), Title, Edition, Publisher, Year of Publication etc	2. ( Text books,					
Refe	rence Books, Journals, Rej	ports, Websites etc. in the IEEE format)						
1.	Taha H. A., Operations F	esearch: An Introduction, 7th edition, PHI, 2002.						
2.	Rao, S. S Engineering Optimization, Theory and Practice, Third Edition, New Age International							
	Publishers, 2010.							
3.	Wagner, H. M., Principle	s of Operations Research with Applications to Managerial Decis	sions, Prentice					
	Hall of India Pvt. Ltd., 19	075.						
4.	Hillier F. and Lieberman	G. J., Introduction to Operations Research, 6th edition, McGraw	v-Hill, 1995.					

Course Code	19B1NHS812	Semester- Even		Semester8thSession2018 - 2019Month fromJanuary2019 to June2019		
Course Name	International Finance					
Credits	3	Contact Hours 3-0-0				
Faculty (Names)	Coordinator(s)	Dr. Mukta Mani				
	Teacher(s) (Alphabetically)	Dr. Mukta Mani				

COURSE OUTCOMES COURSE OUTCOMES		COGNITIVE LEVELS
C402-12.1	Explain the global market scenario, its imperfections and risks which affect the multinational businesses trade.	Understanding level (C2)
C402-12.2	Analyze the international transactions of balance of payments and understand their relationship with key macroeconomic indicators	Analyzing level (C4)
C402-12.3	Apply the concepts of foreign exchange market and currency derivatives for making transactions in foreign exchange market	Applying level (C3)
C402-12.4	Analyze the role of parity conditions and other factors in exchange rate determination.	Analyzing level (C4)
C402-12.5	Analyze the central bank's intervention in foreign exchange market and evaluate the causes of exchange rate disequilibrium	Evaluating level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Financial Globalization and Risk, Global financial	4
		Marketplace, Eurocurrency market and LIBOR, Theory of	
		comparative advantage, Globalization process	
2.	Balance of Payments	BOP transactions, accounting, Accounts of BOP, Capital	4
		and Financial Accounts, BOP and key macroeconomic	
		variables	
3.	Exchange Rates	Foreign Exchange market, functions, participants, types of	6
		transactions: spot, forward and swap transactions	_
		Methods of stating exchange rates, quotations and changes	
		in exchange rates	
4.	Foreign Exchange rate	Exchange rate determination theories, Currency market	6
	determination and	intervention, disequilibrium, forecasting	-
	forecasting		
5.	Forward Exchange	Forward foreign exchange, premiums and discounts,	6
		forward rates vs future spot rates, payoff profile, swaps,	, , , , , , , , , , , , , , , , , , ,
		forward quotations	
6.	Currency Futures and	Foreign currency futures, Currency options, Forwards,	6
	options market	futures and options compared	

7.	International Parity	Purchasing Power Parity and Interest Parity	5
	Conditions	Prices and Exchange rates, Exchange rate pass-through,	-
		Forward rate, Prices, Interest rates and exchange rates in	
		equilibrium	
8.	Transaction and	Types of foreign exchange exposure, Hedging, Overview	5
	Translation Exposure	of translation, Translation methods, US translation	-
		procedures	
	·	Total	42

<b>Evaluation Criteria</b>	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
ТА	25 (Class test, Assignment, 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.	Eiteman, D K., Stonehill, A.I. and Moffett, M.H., <i>Multinational Business Finance</i> , 14 <sup>th</sup> Ed., Pearson India Education, 2018.
2.	Levi, M.D., International Finance, 4th Ed., Routledge Publication, 2009.
3.	Jain, P K., Peyrard, J. and Yadav, S.S., International Financial Management, Macmillan India, 1999.
4.	Desai, M.A., International Finance- A Casebook, Wiley India, 2007.
5.	Shapiro, Alan C., Multinational Financial Management, 7th Ed., John Wiley and Sons Inc., 2003.

## Detailed Syllabus Lab-wise Breakup

Course Co	de	15B19EC891	Semester Eve	n	Semeste	er 8 <sup>th</sup> Sess	ion 2018 -2019
			(specify Odd/Even) Month from January		y to May		
Course Name Major Project Part-2							
Credits	Credits 12 Contact Hours						
Faculty (Names)         Coordinator(s)         Dr. Sajai Vir Singh							
	Teacher(s) (Alphabetically)Mr. Varun Goel						
COURSE OUTCOMES			COGNITIVE LEVELS				
CO1	CO1Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering.Und (Le			Understanding (Level II)			
CO2Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time			e	Analyzing (Level IV)			
CO3	O3 Evaluate /Validate sound conclusions based on evidence and analysis			Evaluating (Level V)			
CO4	<b>Develop the skill in student so that they can communicate effectively in both</b> Create (Level VI) <b>Verbal and written form.</b> Create (Level VI)			Create (Level VI)			
Fyaluation	) Criter						

Evaluation Criteria		
Components	Maximum Marks	
Mid Term Viva (V1)	20	
End Term Viva (V2)	30	
Day to Day	30	
Project Report	20	
Total	100	