# B.E. Computer Science and Engineering CURRICULUM AND SYLLABI I to VI Semesters Regulation - 2020



# ENGINEERING COLLEGE (Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Accredited by NBA and NAAC with "A+"and Recognized by UGC (2f&12B)

#### KOMARAPALAYAM - 637303

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# **EXCEL ENGINEERING COLLEGE**

(Autonomous) Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai Accredited by NBA, NAAC with "A<sup>+</sup>" and Recognised by UGC (2f &12B) KOMARAPALAYAM – 637303

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING B E Computer Science and Engineering REGULATION 2020 I to VIII Semesters Curriculum

	15	SEMESTER							
Code No.	Course	Category	Р	Periods Week		C	Maximum Ma		Marks
			L	Т	P		CA	FE	Total
Theory Co	purse(s)								
20MA103	Mathematics - I for Computing Sciences	BS	3	2	0	4	40	60	100
20CS101	Computer Hardware and Networking	ËS	3	0	0	3	40	60	100
Theory wit	h Practical Course(s)								
20ENEXX	Language Elective - I*	HSS	2	0	2	3	50	50	100
20PH101	Physics for Computing Sciences	BS	3	0	2	4	50	50	100
20CS102	Problem Solving using Python	ES	3	0	2	4	50	50	100
Practical C	Course(s)								
20CS103	Computer Practices Laboratory	ES	0	0	2	1	50	50	100
Mandatory	Course								
20MC101	Induction Programme	MC	2 '	Weel	s	0	100		100
	TOTAL		14	2	8	19	380	320	700

*Language	Electives - I								
Code No.	Course	Category	Periods / Week		с	Maximum Marks			
			L	Т	Ρ		CA	FE	Total
20ENE01	Communicative English	HSS	2	0	2	3	50	50	100
20ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022

# CHAIRMAN - BOARD OF STUDIES

	II SEMESTER										
Code No.	Course	Category	Per W	iods /eek	1	с	Maxi	mum N	larks		
			L	Т	Ρ		CA	FE	Total		
Theory Co	urse(s)										
20MA203	Mathematics - II for Computing Sciences	BS	3	2	0	4	40	60	100		
20CS202	Programming and Data Structures	PC	3	0	0	3	40	60	100		
Theory wit	th Practical Course(s)				-						
20ENEXX	Language Elective - II*	HSS	2	0	2	3	50	50	100		
20CH201	Chemistry for Computing Sciences	BS	3	0	2	4	50	50	100		
20ME203	Engineering Graphics	ES	1	0	4	3	50	50	100		
Practical (	Course(s)	4.01 (mar 1 / miles)									
20CS203	Programming and Data Structures Laboratory	PC	0	0	4	2	50	50	100		
Mandator	y Course										
20MC202	Interpersonal Skills	MC	0	0	2	0	100		100		
	TOTAL		12	2	14	19	380	320	700		

*Language	Electives – II									
Code No.	Course	Category	Periods / Week			с	Maximum Marks			
			L	Т	Ρ		СА	FE	Total	
20ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100	
20ENE03	Hindi	HSS	2	0	2	3	50	50	100	
20ENE04	French	HSS	2	0	2	3	50	50	100	
20ENE05	German	HSS	2	0	2	3	50	50	100	

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022

		SEMESTER	2						
Code No	. Course	Category	P	Periods Week			Мах	kimum	Marks
		48	L	Т	P	С	СА	FE	
Theory Co	ourse(s)			1	1	1	-		Total
20MA303	Discrete Mathematics and Graph Theory	BS	3	2	0	4	40	60	100
20CS301	Design and Analysis of Algorithms	PC	3	0	0	3	40	60	100
20CS302	Object Oriented Programming	PC	3	0	0	3	10	60	100
20CS303	Computer Architecture and Organization	ES	3	0	0	3	40	60	100
Theory wit	h Practical Course(s)								A
20EC306	Digital Logics and Microprocessor	ES	3	0	2	4	50	50	100
20CS304	Operating Systems	PC	3	0	2	4	50	50	100
Practical C	Course(s)				_		00	00	
20CS305	Object Oriented Programming Laboratory	PC	0	0	4	2	50	50	100
landatory	Course								
20MC301	Environmental Sciences	MC	2	0	0	0	100		100
	TOTAL		20	2	8	23	410	390	800
				_			110	000	000

	IV S	EMESTER							
Code No.	Course	Category	Pe V	Periods / Week		6	Maximum Marks		
			L	Т	P		CA	FE	Total
Theory Co	purse(s)								
20MA403	Probability and Statistical Methods	BS	3	2	0	4	40	60	100
20CS401	Formal Language and Automata Theory	PC	3	0	0	3	40	60	100
20CS402	Software Engineering	PC	3	0	0	3	40	60	100
20CS403	Data Communication and Computer Networks	ES	3	0	0	3	40	60	100
Theory wi	th Practical Course(s)			I					
20CS404	Database Management Systems	PC	3	0	2	4	50	50	100
20CS405	Computer Graphics and Multimedia	PC	3	0	2	4	50	50	100
Practical C	Course(s)	!							
20CS406	Data Communication and Computer Networks Laboratory	ES	0	0	4	2	50	50	100
Mandatory	Course					-			
20MC401	Soft Skills	MC	2	0	0	0	100		100
	TOTAL	-	20	2	8	23	410	390	800

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	V SEMESTER									
Code No.	Course	Category	Pe	eriods Neek	s/ (		Maximum Marks			
			L	Т	Ρ	С	CA	FE	Total	
Theory Co	urse(s)									
20CS501	Foundations of Artificial Intelligence	PC	3	0	0	3	40	60	100	
20CS502	Compiler Design	PC	3	0	0	3	40	60	100	
20CSEXX	Professional Elective - I	PE	3	0	0	3	40	60	100	
20YYOXX	Open Elective - I	OE	3	0	0	3	40	60	100	
Theory wit	h Practical Course(s)									
20CS503	Object Oriented Analysis and Design	PC	3	0	2	4	50	50	100	
20CS504	Cloud Computing Services	PC	3	0	2	4	50	50	100	
Practical (	Course(s)									
20CS505	Compiler Design Laboratory	PC	0	0	2	1	50	50	100	
	TOTAL		18	0	6	21	310	390	700	

	VI S	EMESTER							
Code No.	Course	Category	Pe	eriod Neel	s / <	с	Maximum Marks		Marks
			L	Т	Р		CA	FE	Total
Theory Cou	urse(s)								
20CS601	Machine Learning Techniques	PC	3	0	0	3	40	60	100
20CS602	Professional Ethics and Human Values	HSS	3	0	0	3	40	60	100
20CS603	Data Analytics	PC	3	0	0	3	40	60	100
20CSEXX	Professional Elective - II	PE	3	0	0	3	40	60	100
20YYOXX	Open Elective - II	OE	3	0	0	3	40	60	100
Theory witl	n Practical Course(s)								
20CS604	Web Technology	PC	3	0	2	4	50	50	100
Practical C	Course(s)								
20CS605	Machine Learning Laboratory	PC	0	0	4	2	50	50	100
20CS606	Mini project	EEC	0	0	2	1	50	50	100
20CS607	Internship	EEC	2 V	Veek	s	1	100	-	100
IC.	TOTAL		18	0	8	23	450	450	900

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		/II SEMESTER	२						
Code No	Course	Category	F	Periods / Week			Maximum Marks		
Theory C			L	Т	P		СА	FE	Total
									1
20CS701	Software Testing and Quality Assurance	PC	3	0	0	3	40	60	100
20CSEXX	Professional Elective - III	PE	2		+	-		00	100
20CSEXX	Professional Elective IV		3	0	0	3	40	60	100
0010/010		PE	3	0	0	3	40	60	100
20YYOXX	Open Elective - III	OE	3	0	0	2	10	00	100
Theory wit	th Practical Course(s)		-				40	60	100
20CS702	Cryptography and Network Security	PC	3	0	2	4	50	50	100
20CS703	IoT Fundamentals and Architecture	PC	3	0	2	4	50	50	100
Practical C	ourse(s)								
20CS704	Design Project	FEC	0	0	2	4	50		
	TOTAL		v	-	4	- 1	50	50	100
_	IOTAL		18	0	6	21	310	390	700

	l.	/III SEMESTER	2						
Code No.	Course	Category	Periods / Week			с	Maximum Marks		
			L	Т	Р		СА	FE	Total
Theory Co	ourse(s)								
20CSEXX	Professional Elective - V	PE	3	0	0	3	40	60	100
20CSEXX	Professional Elective - VI	PE	3	0	0	3	40	60	100
Practical (	Course(s)								
20CS801	Major Project	EEC	0	0	20	10	50	50	100
	TOTAL		6	0	20	16	130	170	300

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Professional Electives (PE)											
Stream I Artificial Intelligence & Machine Learning											
Code No.	Course	Category	Pei W	riods /eek	1	C Maximum Mar			Marks		
			L	Т	Ρ		CA	FE	Total		
20CSE01	Deep Learning Techniques	PE	3	0	0	3	40	60	100		
20CSE02	Neural Networks and Fuzzy Logic	PE	3	0	0	3	40	60	100		
20CSE03	Robotics and Intelligent Systems	PE	3	0	0	3	40	60	100		
20CSE04	Business Intelligence	PE	3	0	0	3	40	60	100		
20CSE05	Computer Vision and Applications	PE	3	0	0	3	40	60	100		
20CSE06	Optimization Techniques	PE	3	0	0	3	40	60	100		
20CSE07	Computational Intelligence	PE	3	0	0	3	40	60	100		
20CSE08	Augmented Reality & Virtual Reality	PE	3	0	0	3	40	60	100		
20CSE09	Natural Language Processing	PE	3	0	0	3	40	60	100		
20CSE10	Social Network Analysis	PE	3	0	0	3	40	60	100		

Stream II C	yber Security and Forensics									
Code No.	Course	Category	Periods / Week			C	Maximum Marks			
			L	Т	Ρ	U	CA	FE	Total	
20CSE21	Cyber Law and Ethics	PE	3	0	0	3	40	60	100	
20CSE22	Cyber Forensics	PE	3	0	0	3	40	60	100	
20CSE23	Ethical Hacking Fundamentals	PE	3	0	0	3	40	60	100	
20CSE24	Secure Cloud Computing	PE	3	0	0	3	40	60	100	
20CSE25	Information Security	PE	3	0	0	3	40	60	100	
20CSE26	Quantum Cryptography	PE	3	0	0	3	40	60	100	
20CSE27	Block chain and Crypto currency Technologies	PE	3	0	0	3	40	60	100	
20CSE28	Cyber Crime and Computer Ethics	PE	3	0	0	3	40	60	100	
20CSE29	Mobile Application Security	PE	3	0	0	3	40	60	100	
20CSE30	Intrusion Detection and Prevention	PE	3	0	0	3	40	60	100	

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Stream III	Internet of Things								
Code No.	Course	Category	Pe V	eriod: Veel	s/ (	с	Maximum Marks		
		1	L	Т	Ρ		СА	FE       T         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1         60       1	Total
20CSE41	Principles of Sensors and Signal Conditioning	PE	3	0	0	3	40	60	100
20CSE42	Data Acquisition	PE	3	0	0	3	40	60	100
20CSE43	Wireless sensor Networks	PE	3	0	0	3	40	60	100
20CSE44	EDGE Computing Technologies	PE	3	0	0	3	40	60	100
20CSE45	Mobile Computing	PE	3	0	0	3	40	60	100
20CSE46	Wearable Computing	PE	3	0	0	3	40	60	100
20CSE47	IoT Programming	PE	3	0	0	3	40	60	100
20CSE48	IoT Security and Trust	PE	3	0	0	3	40	60	100
20CSE49	IoT Applications and Web development	PE	3	0	0	3	40	60	100
20CSE50	Industrial IoT	PE	3	0	0	3	40	60	100

	Open E	lectives(OB	E)						
Code No.	Course	Category	Pe V	riods Veek	s / (	с	Maxi	mum	Marks
			L	Т	Ρ		CA	FE 60 60 60 60 60 60 60 60 60	Total
20CSO01	Big data Tools & Analytics	OE	3	0	0	3	40	60	100
20CSO02	IoT Architecture and Protocols	OE	3	0	0	3	40	60	100
20CSO03	Programming in C	OE	3	0	0	3	40	60	100
20CSO04	GPU Architecture and Programming	OE	3	0	0	3	40	60	100
20CSO05	Software Project Management	OE	3	0	0	3	40	60	100
20CSO06	Foundations of Block chain Technology	OE	3	0	0	3	40	60	100
20CSO07	Principles of Cloud Computing	OE	3	0	0	3	40	60	100
20CSO08	Cyber Security and Ethical	OE	3	0	0	3	40	60	100
20CSO09	Multimedia and Animation	OE	3	0	0	3	40	60	100
20CSO10	Java Programming	OE	3	0	0	3	40	60	100

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	ONE C	REDIT CO	URSI	ES		· · · · · · · · · · · · · · · · · · ·			
Code No.	Course	Category	F	eriod: Week	s / (	с	Max	Marks	
			L	Т	Ρ		СА	FE	Total
20CSA01	Keras Tool	EEC	0	0	2	1	100	7	100
20CSA02	ORANGE Tool	EEC	0	0	2	1	100	-	100
20CSA03	Tensor Flow	EEC	0	0	2	1	100	=	100
20CSA04	Raspberry PI	EEC -	0	0	2	1	100	-	100
20CSA05	R Programming	EEC	0	0	2	1	100	-	100
20CSA06	Hadoop- Map Reduce	EEC	0	0	2	1	100	-	100
20CSA07	WEKA Tool	EEC	0	0	2	1	100	-	100
20CSA08	Rapid Miner Tool	EEC	0	0	2	1	100	-	100
20CSA09	Maya Tool	EEC	0	0	2	1	100	- 2	100
20CSA10	Eclipse	EEC	0	0	2	1	100	3	100
20CSA11	Embedded Systems in Python	EEC	0	0	2	1	100	-	100
20CSA12	Linux Shell Programming	EEC	0	0	2	1	100		100

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S.	Category			CRE	DITS F	PER SE	MEST	ER		Total	
4		1	11	111	IV	V	VI	VII	VIII	Credit (AICTE)	Credits in %
1	HSS	3	3	_			3			9 (10-14)	5.45%
2	BS	8	8	4	4					24 (22-28)	14.54%
3	ES	8	3	7	5					23 (24)	13.93%
4	PC		5	12	14	15	12	11		69 (48)	41.81%
5	PE					3	3	6	6	18 (18)	10.90%
6	OE					3	3	3		9	5.45%
7	EEC						2	1	10	13 (12-16)	7.87%
8	MC	0	0	0	0					0	0%
T	otal	19	19	23	23	21	23	21	16	165	100.00%

## SUMMARY

HSS - Humanities and Social Sciences

- **BS** Basic Sciences
- ES Engineering Sciences
- PC Professional Core
- PE Professional Electives
- OE Open Electives
- EEC Employability Enhancement Courses
- MC Mandatory Courses (Non-Credit Courses)
- CA Continuous Assessment
- FE Final Examination

Passed in Board of studies Meeting 25.02.2022

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20MA103	Mathematics-I for Computing Sciences	nces L T ) 3 2	Ρ	С	
	(Common to CSE, IT and AI & DS)	3	2	0	4
Nature of Course	Basic Sciences	1			-
Pre requisites	Fundamentals of Basic Mathematics				

#### **Course Objectives**

The course is intended to

- 1. Acquire the concept of matrix algebra techniques those are needed by engineers for practical applications.
- 2. Acquaint the mathematical tools needed in evaluating limits, derivatives and differentiation of one variable.
- 3. Learn the curvature, calculate the radius of curvature, centre, evolutes, involutes and envelope of curves.
- 4. Acquire the knowledge of linear and simultaneous differential equations.
- 5. Learn the Green's theorem, Stokes' theorem and the Divergence theorem to compute integrals.

## Course Outcomes

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Identify the eigen values, eigenvectors and apply Cayley- Hamilton theorem.	Apply
CO2	Interpret the limit definition and rules of differentiation to differentiate the functions.	Understand
СОЗ	Identify the circle of curvature, evolutes and envelope of the curves.	Understand
CO4	Solve the linear and simultaneous differential equations.	Apply
CO5	Interpret the Green's theorem, Stokes' theorem, or Divergence theorem to evaluate integrals.	Apply

#### Course Contents:

#### **Unit- I Matrices**

Characteristic equation - Eigen values and Eigen vectors of a real matrix - Properties(statement only) - Cayley-Hamilton theorem and its applications - Orthogonal transformation of a symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by orthogonal transformation.

#### Unit - II Limits and Continuity

Representation of functions – Limits of a function – Continuity – Derivatives – Differentiation rules -Maxima and Minima of functions of one variable.

## Unit – III Differential Calculus

Curvature - Curvature in Cartesian co-ordinates - Centre and Radius of curvature- Circle of curvature- Evolutes and Involutes-Envelopes. 12

#### Unit – IV Ordinary Differential Equations

Linear differential equations of second and higher order with constant co-efficient - R.H.S is sinax,  $\cos x$ ,  $e^{\alpha x}$ ,  $x^n$  – Differential equations with variable co-efficients : Cauchy's and Legendre's form of linear equation -- Method of variation of parameters. 12

#### Unit-V Vector Calculus

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) -Verification of theorem and simple applications.

#### **Total: 60 Periods**

Passed in Board of studies Meeting on 21.10.2020 Approved in Academic Council Meeting on 06.11.2020





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#### Text Books:

- 1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2019.
- 2. Veerarajan T, "Engineering Mathematics for Semester I and II", Tata McGraw Hill Publishers, 3<sup>rd</sup> Edition, 2014.

## **Reference Books:**

1. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co.Publishers, 3<sup>rd</sup> Edition, 2019.

2. Weir M.D. and Joel Hass, "Thomas calculus" Pearson Publishers, 12th Edition, 2016.

#### Additional References:

- 1 nptel.ac.in/courses/111/105/111105121
- 2. nptel.ac.in/courses/122/104/122104017

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Cos		_		Pos										PSOs				
003	1	2	3	4	5	6	7	8	9	10	11	12	1	1 2				
CO1	3	3	2								_		3					
CO2	3	3	2			1	-						2	2				
CO3	3	2	2										2					
CO4	3	3	2										3					
CO5	3	2	2				1	f i					2	100				
	3 High 2 Medium 1									1	Low							

Formative a	ssessment	- //	<i></i>
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class/ Assignment	5	15
	Attendance	5	

#### **Summative Assessment**

Bloom's Category	Internal	Assessment E	xaminations	<b>Final Examination</b>
Diooni a Category	IAE1 (7.5)	IAE2 (7.5)	IAE3 (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

2005101	COMPUTER HARDWARE AND NETWORKING	L	Т	P	С
2003101	( Common to CSE, IT and AI)	3	0	0	3
Nature of Course	Engineering Sciences				
Pre requisites	Fundamentals of computers				

Passed in Board of studies Meeting on 21 10 2020

Approved in Academic Council Meeting on 06.11.2020

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## **Course Objectives**

The course is intended to

- 1. Impart knowledge of mother board components and memory storage devices.
- 2. Gain knowledge of I/O devices and interfaces.
- Learn the Maintenance and Trouble Shooting of Desktop.
- 4. Develop a clear understanding about network devices.
- 5. Explore the knowledge on network model and various network protocols

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Interpret the concepts of motherboard components and memory storage devices	Understand
CO2.	Manipulate I/O Devices and Interfaces	Apply
CO3.	Carry out experimental investigation for maintenance of Desktop and Laptop.	Apply
CO4.	Summarize computer viruses and troubleshooting mechanism.	Understand
CO5.	Determine the properties of various network devices.	Understand

#### **Course Contents:**

#### Unit - I Motherboard Components and Memory Storage Devices

Introduction: Hardware, Software and Firmware. Mother board, IO and memory expansion slots, SMPS, Drives, front panel and rear panel connectors. Processors: multi core Processor Architecture, Evolution of processors - Pentium, dual core, core i3, i5, i7 (Concepts only) - Bus Standards: PCI, AGP, and PCMCIA Primary Memory: Introduction-Main Memory, Cache memory - DDR2, DDR3 and Direct RDRAM. Secondary Storage: Hard Disk - Construction - Working Principle Specification of IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting.

#### Unit - II I/O Devices and Interface

Keyboard: Signals - operations -troubleshooting; wireless Keyboard. Mouse: types, connectors, operations- troubleshooting. Printers: Introduction-Types- Dot Matrix, Inkjet Laser, Multi Function Printer and Thermal printer - Operations-Troubleshooting. I/O Ports: Serial, Parallel, USB, Game Port and HDMI. Displays: Principles of LED, LCD and TFT Displays. Graphic Cards: VGA and SVGA card. Power Supply: Servo Stabilizers, online and offline UPS - working principles; SMPS: Operation and block diagram of ATX Power supply.

#### Maintenance of Desktop and Laptop Unit - III

Bios-setup: Standard CMOS setup, Power management, advanced chipset features, PC Bios communication - upgrading BIOS, Flash BIOS -setup. POST: Definition - IPL hardware - POST Test sequence - beep codes. Laptop: Types of laptop -block diagram - working principlesconfiguring laptops.

#### Trouble Shooting and Computer Viruses Unit – IV

Diagnostic Software and Viruses: Computer Viruses - Precautions -Anti-virus Software identifying the signature of viruses - Firewalls and latest diagnostic software. Installation and Troubleshooting: Formatting, Partitioning and Installation of OS - Trouble Shooting Hardware problems.

#### Unit - V **Computer Network Devices**

Data Communication: Components of a data communication. Data flow: simplex - half duplex full duplex; Topologies: Star, Bus, Ring, Mesh, Hybrid - Advantages and Disadvantages of each topology. Networks: Definition -Types of Networks: LAN - MAN - WAN - CAN - HAN - Internet -Intranet -Extranet, Client-Server, Peer To Peer Networks. Network devices: Features and concepts of Switches - Routers (Wired and Wireless) - Gateways.

Total: 45 Periods

Passed in Board of studies Meeting on 21 10.2020 Approved in Academic Council Meeting on 06.11.2020

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## **Text Books:**

- 1. B Govindrajalu, "IBM PC and Clones Hardware Troubleshooting and Maintenance", Tata Mc Graw hill Publishers, 2008.
- 2. BehrouzA.Forouzan, "Data Communication and networking", Tata Mc-Graw Hill, NewDelhi.

#### **Reference Books:**

- D.Balasubramanian, "Computer Installation and Servicing", Tata McGraw Hill
   Michael ,Stephen J Bigelow, "Troubleshooting, Maintaining and Repairing PCs", Tata MCGraw Hill Publication.
- 3. AchyutGodbole," Computer Networks", TataMc-Graw Hill -New Delhi.
- 4. Kaveh Pahlavan and Prashant Krishnamurty, "Principles of Wireless Networks- A unified Approach", Pearson Education, 2002.

Марріі	ng of C	Cours	e Out	come (	s (CO Specif	ls) wit fic Ou	h Pro tcom	ogram es (P	nme ( SOs)	Dutcor	nes (P	'Os) P	rogra	amme	•		
POs													PSOs				
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO1	3	3	2		1			_				1	3	1			
CO2	3	3	2									1	3	1			
001	3	3	2		1							1	3	1			
CO4	3	3	2		1							1	3	1	1		
CO5	3	3	2									1	3	1	-		
	3	3 High 2 Medium 1												Low			

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		FC	ormative asses	sment		-		
Bloom's Level		Assessn	Marks	Total marks				
Remember	Classroom	or Online Qui	z		5			
Understand	Class Pres	entation/Powe	5	15				
	Attendance	5						
_	The second secon	Su	mmative Asse	ssment				
		Continu	ous Assessme	ent Tests	Terminal Exa	Terminal Examination		
Bloom's C	ategory	IAE1 (7.5)	IAE2 (7.5)	IAE3 (10)	(60)			
Remen	nber	10	10	10	20			
Unders	tand	20	20	20	50			
Арр	ly	20	20	20	30			
Analyse		0	0	0	0			
Evalu	ate	0	0	0	0			
Crea	ite	0	0	0	0			

20PH101	PH101 Physics for Computing Sciences (Common to CSE, IT and AI & DS) ature of Course Basic Sciences Fundamentals of Basic Physics	L 3	T O	P 2	C 4
Nature of Course	Basic Sciences			12 2	67
Pre requisites	Fundamentals of Basic Physics		-	-	_

Course Objectives: The course is intended to

- 1. Impart knowledge of optics, especially laser and their applications in fiber optics.
- Gain knowledge to learn thermal properties of materials and their applications.

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- 3. Provide knowledge of properties of matter like elasticity and its applications.
- 4. Learn the electronic properties of materials like semiconductors and its applications.
- 5. Develop a clear understanding of optical devices like solar cell, LED etc.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Compare the working of lasers and propagation of light through optical fibers and its applications.	Understand
CO2	Demonstrate the thermal conductivity of the good and bad conductors	Understand
CO3	Explain the knowledge about elasticity	Understand
CO4	Interpret the knowledge about semiconductor materials.	Understand
CO5	Illustrate the working of optoelectronic devices.	Understand

#### **Course Contents:**

#### UNIT I Laser and Fiber Optics

Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index, mode) – optical fiber communication system – fiber optic endoscope.

#### UNIT II Thermal Physics

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications : heat exchangers in refrigerators, ovens and solar water heaters.

#### UNIT III Properties of Matter

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever – uniform and non-uniform bending - I-shaped girders - stress due to bending in beams.

#### UNIT IV Semiconductor Physics

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration –Hall effect and its applications.

#### UNIT V Optical Properties of Materials

Classification of optical materials – carrier generation and recombination processes - photo current in a P- N diode: principle and working – solar cell and photo detectors: working principle – LED: principle and working – Organic LED: principle and working, advantages over LED – Laser diodes: principle, working and applications.

#### Total: 45 Periods

List of Experiments	CO Mapping	RBT	
Determination of rigidity modulus – Torsion pendulum	CO3	Apply	
Determination of Young's modulus by non-uniform bending method.	CO3	Apply	
Determination of wavelength, and particle size using Laser	CO1	Apply	
Determination of acceptance angle in an optical fiber	CO1	Apply	
	List of Experiments Determination of rigidity modulus – Torsion pendulum Determination of Young's modulus by non-uniform bending method. Determination of wavelength, and particle size using Laser Determination of acceptance angle in an optical fiber	List of ExperimentsCO MappingDetermination of rigidity modulus – Torsion pendulumCO3Determination of Young's modulus by non-uniform bending method.CO3Determination of wavelength, and particle size using LaserCO1Determination of acceptance angle in an optical fiberCO1	

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5	Determination of thermal conductivity of a bad conductor by Lee's Disc method	CO2	Apply
6	Determination of velocity of sound and compressibility of	CO3	Apply
7	Determination of Coefficient of viscosity of liquid	CO3	Apply

#### Total: 30 Periods

#### TEXT BOOKS:

1. Bhattacharya, D.K and Poonam, T, "Engineering Physics", 2nd edition, Oxford University Press, 2015.

2. M.N. Avadhanulu, M.N. & Kshirsagar PG. "A Text book of Engineering Physics", 10th edition, S.Chand and company, Ltd., New Delhi, 2014.

3. William D.Callister, Jr and David, G.Bethwisch, "Materials Science and Engineering", 9th edition, John Wiley & Sons, Inc, 2019.

#### **REFERENCES:**

1. Halliday, D, Resnick, R and Walker, J, "Principles of Physics", 10th edition, Wiley, 2014.

2. Serway, R.A. & Jewett, J.W, "Physics for Scientists and Engineers", 9th edition, Cengage

3. Raghavan, V. "Materials Science and Engineering, A First course", 5th edition, PHI Learning, Learning, 2019. 2015.

#### Web References:

1. https://nptel.ac.in/courses/115/107/115107095/

2. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniformbending-6aMRx

3. https://nptel.ac.in/courses/115/105/115105099/#

https://www.youtube.com/watch?v=uv0LxMoalEQ

Specific Outcomes (PSO)											PSOs				
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1									-		-	-
CO2	3	1	1		1			-		-	_	-			-
CO3	3	2	1												
CO4	3	1	1						1		-		-	-	
CO5	3		1			10	-		-						

			Summative	Assessment			Final
Bloom' s Level		The	eory Marks	Practi	cal	Examinati	
	IAE-I [7.5]	IAE-II [7.5]	IAE-III [10]	Attendance [5]	120	Rubric based CIA Marks]	on (Theory) [50 marks]
			20	-			30
Remember	30	30	30	-	-	40	62
Understand	62	62	62		-	60	8
Apply	8	8	8		00		
Analyse				1	_	-	
Evaluate	•	1 4 1	÷		-		
Create	1						1
	3	High	2	Medium	1	Low	

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	PROBLEM SOLVING USING PYTHON	L	Τ	Ρ	С
20CS102	( Common to all Branches)	3	0	2	4
Nature of Course	Engineering Sciences				
Pre requisites	Mathematical and Logical Knowledge			1	

#### **Course Objectives**

The course is intended

- 1. To think logically and write algorithm and draw flow charts for problems.
- 2. To read and write simple Python programs.
- 3. To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- 5. To use Python data structures lists, tuples, dictionaries and files,

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Develop algorithmic solutions to simple computational problems and read, write, execute by simple python programs.	Apply
CO2	Structure simple python programs for solving problems.	Understand
CO3	Administer the role of control statements and functions involving the idea of modularity.	Apply
CO4	Represent compound data using python strings and lists.	Apply
CO5	Read and write data from/to files in python Programs.	Understand

#### Course Contents:

#### **Basics of Computers & Problem Solving** Unit I

Computer Basics - Components-Computer organization - Computer Software- Types of software -Software Development steps -Need for logical analysis and thinking- Algorithms - Flowchart -Number system

#### Introduction of Python Programming Unit II

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, Input and Output Statements.

#### **Control statements and Functions** Unit III

Conditional (if), alternative (if-else), chained conditional (if-elif-else)-Iteration-while, for, break, continue, pass - Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.

#### Strings and Lists Unit IV

Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension, searching and sorting.

#### Unit V Tuples, Dictionaries and Files

Tuples- Tuple assignment, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Files and Exception-Text files, reading and writing files, format Operator, Exception handling.

TOTAL: 45 Periods

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S.No	List of Experiments	COMapping	RBT
1	Write a algorithm & draw flowchart for simple computational problems	C01	Understand
2	Write a program to perform different arithmetic operations on numbers in python.	CO2	Understand
3	Write a python program to implement the various control structures	CO3	Apply
4	Write a python program for computational problems using recursive function.	СОЗ	Apply
5	Demonstrate use of list for data validation.	CO4	Apply
6	Develop a python program to explore string functions	CO4	Analyze
7	Implement linear search and binary search.	CO4	Apply
8	Develop a python program to implement sorting methods	CO4	Analyze
9	Develop python programs to perform operations on dictionaries.	CO5	Analyze
10	Write a python program to read and write into a file	CO5	Apply

#### **Text Books:**

**TOTAL: 30 Periods** 

- 1. ReemaThareja, "Problem Solving and Programming with Python", Oxford University Press, 2018
- 2. Dr. R. NageswaraRao, "Core Python Programming", Dreamtech Press, 2017 Edition

#### **Reference Books:**

- 1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012
- 2. Ashok NamdevKamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.
- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013
- 4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015

lapping of	Course	e Out	come	es (C	0) w	rith F Dutco	Progr	amm s (PS	e Ou O)	tcom	es (P	'O) Pr	ogramr	ne Spo	ecifi
-	POs										PSOs				
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1										3	1	
CO2	3	2	1										3	1	
CO3	3	2	2										3	1	
CO4	3	2	2									-	3	1	
CO5	3	2	2										3	1	
	3		Hi	gh	him	2		٨	/lediu	m		1	Low		14

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100		(	Summative Continuous	e assessment Assessment		1	
100 C		The	ory Marks	Practical	Final		
Bloom's Level	IAE-I [7.5]	IAE-II [7.5]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	Examination (Theory) [50 marks]	
Remember	10	10	10			20	
Understand	20	20	20		30	50	
Apply	20	20	20		50	30	
Analyse		2	-		20		
Evaluate	÷5		19		1.00	•	
Create	÷.						

20CS103		COMPUTER PRACTICES LABORATORY (Common to CSE , IT and AI)	L 0	Т 0	P 2	C 1
Nature of Course		Engineering Sciences				
Pre requisit	tes	NA				

## **Course Objectives**

The course is intended to

- 1. Learn the use of basic hardware components
- 2. Make familiar with BIOS setup and I/O ports
- 3. Impart knowledge in configuration and partitioning
- Experiment the installation and uninstallation of various hardware and software components.
- 5. Develop network group and sharing between devices

#### **Course Outcomes**

On successful completion of the course, students will be able to

Course Outcome	Bloom's Level
Interpret the concepts of hardware devices	Understand
Make simple BIOS setup and I/O ports	Understand
Experiment the configuration and partitioning	Apply
Carry out basic installation setup of hardware devices	Apply
Apply the workgroup creation network and sharing	Apply
	Course Outcome Interpret the concepts of hardware devices Make simple BIOS setup and I/O ports Experiment the configuration and partitioning Carry out basic installation setup of hardware devices Apply the workgroup creation network and sharing

List of Exercises

S.No	List of Exercises	CO Mapping	RBT
1	Study of mother Board, Power supply, Keyboard and monitors	C01	Understand
2	Study of Building and Assembling a Desktop PC	CO1	Understand
3	BIOS Setup Utility. Input- Output Ports	CO1	Understand
4	Hard Disk Drive Partitioning and Formatting	CO2	Understand
5	Installing and configuring a DVD Writer	CO3	Apply

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	B.E. Computer Scie	nce and En	gineering (R-
6	Installing and configuring Operating System.	CO4	Apply
7	Installing Motherboard Device Drivers OS Platform	CO4	Apply
8	Installing and uninstalling an Application Software.	CO4	Apply
9	Printers and Installation of Printers and scanners and Local Printer sharing	CO5	Apply
10	Workgroup based Network using Operating System.	CO5	Apply

## **TOTAL :30 Periods**

				POs			_					. 1		PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	3	1		Ĩ.							2	3	2
CO2	2	1	3	1									2	3	2
CO3	2	1	3	1									2	3	2
CO4	2	2	3	1									2	3	2
CO5	2	2	3	1	-	-	-			-			2	3	2
	3		Hi	gh	N	2		N	lediu	m		1	Low		-

Summative assessment	based on Continuous and End Ser	mester Examination
Bloom's Level	Rubric based Continuous Assessment [50 marks]	Final Examination [50 marks]
Remember		
Understand	20	50
Apply	30	50
Analyze	Constraints and the second sec	
Evaluate		
Create		

20MC101	Induction Programme	Ē	Т	Ρ	С
		2	0	0	0
Nature of Course	Mandatory, Non Credit		1		
Pre requisites	Completion of Schooling at Higher Secondary Level				

## **Course Objectives**

The course is intended to

1. To nurture the character and behavior as a student.

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- 2. To have broad understanding of society and relationships.
- 3. To impart interpersonal and softskills.
- 4. To inspire the students in the field of engineering.
- 5. To provide exposure toindustries.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Perform curricular and co-curricular activities excellently.	Knowledge
CO 2	Do the skill based training with excellence.	Understand
CO 3	Work as team for the given task	Apply
CO 4	Gain character and behaviour	Knowledge
CO 5	Demonstrate the acquired skills effectively	Apply

#### Course Contents PHYSICAL ACTIVITY

Yoga, Sports

CREATIVE ARTS (students can select any one of their choice) Painting, sculpture, pottery, music, craft making and so on UNIVERSAL HUMAN VALUES

Enhancing soft skills

LITERARY AND PROFICIENCY MODULES

Reading, Writing, Speaking- Debate, Role play etc., Communication and computer skills

LECTURES BY EMINENT PEOPLE

Guest lecture by subject experts

VISIT TO LOCAL CITIES

Meditation centers / Industry

#### FAMILARIZATION TO DEPARTMENT / BRANCH INNOVATION

Lectures by Departments Head and senior faculty members

Total Hours: 45

#### Mapping of COs with POs and PSOs

						C	)utcc	mes	(PS	Os)					
	-	1	-				PO	s				1		PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1						2	1	2				3	2		
CO2						2	1	2				3	2		
CO3						2	1	2				3	2		
CO4	1				-	2	1	2				3	2		
CO5	1					2	1	2				3	2		
	3		Hi	gh		2		N	lediu	Im		1	Low		-

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	Continuous Assessment (Non-Credit, Mandatory)									
Bloom's Level	Test -  [20 ]	Test -II [20]	Test - III [20]	Assignment/ Activity [20]	Attendance [20]					
Remember	10	10	10	and the second second	Sec. 2					
Understand	20	20	20	10						
Apply	20	20	20	10	17 00					
Analyse					100					
Evaluate										
Create				1 1 1 1 1 1 1	1.4					

2051504	COMMUNICATIVE ENGLISH	Ľ	Т	Ρ	С
ZUEINEUT	(Common to all B.E. / B.Tech. Programmes)	2	0	2	3
Nature of Course	Humanities and Social Science				
Pre requisites	Nil	205			- 3

#### **Course Objectives**

The course is intended to

- 1. Improve lexical, grammatical and semantic competence.
- 2. Enhance communicative skills in real life situations.
- 3. Augment thinking in all forms of communication.
- 4. Equip with oral and written communication skills.
- 5. Gain employability skills.

#### Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Use effectively the lexical, grammatical and semantic knowledge	Remember
CO2	Communicate with clarity using intentional vocabulary in English	Apply
CO3	Articulate perfectly and express their opinions confidently using communicative strategies	Remember
CO4	Accomplishlistening and reading skills for lifelong learning	Understand
CO5	Comprehend, interpret and present data	Understand

#### **Course Contents**

#### Unit - I Basic structure and Usage

Parts of Speech — Articles – Tenses - Subject-Verb Agreement – Different Grammatical forms of the same word - Listening to Speeches and Conversations from Communication software – Listening to Announcements – Listening and Gap Filling.

#### Unit - II Vocabulary and Language Development

Intentional vocabulary used in and around Airport, Hospital, Hotel, Court –Abbreviations and acronyms - One Word Substitution - Compound words– Homophones and Homonyms – Types of sentences -Ordering Jumbled Sentences Letter writing – informal.

#### Unit –III Oral Communication Skills

Improving fluency – Articulation with pronunciation – Voice modulation in Speaking – One minute talk -Self Introduction and introducing ones friend – Telephonic conversations – Group Discussion – Modal Auxiliaries –discourse markers.

#### Unit –IV Comprehensive Listening and Reading

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Effective listening Strategies — Listening to Interviews from Communication software- Phrasal verbs - Reading Comprehension - "An Astrologer's Day" by R.K.Narayan and "Building a New State" by Dr. A.P.J. Abdul Kalam.

#### Unit – VEffective Writing

6

Interpretation and presentation of data – developing Hints – general essays and paragraph writing – Report Writing – survey report and accident report - Instructions and Recommendations. Total:30 Periods

S.No	List of Exercises	CO Mapping	RBT
1	Role-play One minute talk	3	Understand
2	Role-play – Telephonic conversations	3	Understand
3	Listening to speeches and lectures and gap filling	4	Understand
4	Group Discussion.	4	Understand
5	Articulation with pronunciation practice	3	Apply
6	Listening to Announcements – Listening and Gap Filling	4	Understand
7	Listening to Interviews & Native speakers' Conversations	4	Understand
8	Reading practice with articles in magazine and news papers.	4	Understand
9	Model – Job Interviews	4	Understand
10	Introspective report - Personal analysis	5	Understand
11	Telephone etiquette	3	Remember
12	Reading – Shorter texts and News Articles	4	Understand
13	Role Play – Getting and Giving Permission	3	Remember
14	Self Introduction( Formal )	3	Understand
15	Recommendations/Suggestions	3	Apply

#### **Text Books**

- Rizvi, Ashraf M., "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 5<sup>th</sup> Edition, 2007.
- Board of Editers, "Using English A Coursebook for Undergraduate Engineers and Technologists", Orient BlackSwan Private Limited, Hyderabad, 2<sup>nd</sup> Edition, 2017.

#### **Reference Books:**

- 1. MeenakshiRaman andSangeethaSharma, "Technical Communication",Oxford University Press, USA, 10<sup>th</sup> Edition, 2007.
- John CunnisonCatford, "A Practical Introduction to Phonetics", Clarendon Press, Jamaica, 2<sup>nd</sup> Edition, 2001.
- 3. Hewings. M, "Advanced English Grammar", Cambridge University Press, Chennai, 3<sup>rd</sup> Edition, 2000.
- S P Dhanavel "English and Soft Skills", Orient BlackSwan Private Limited, Hyderabad, 1<sup>st</sup> Edition, 2010.

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#### Web reference:

https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwij4dCTucfsAhXE1pYKHch4AB MYABABGgJ0bA&ohost=www.google.com&cid=CAASEuRo76H-Vx9BpazOOBfXeJSKVQ&sig=AOD64\_3O-HNEnUO4A5sc31MsUfaTBGGdQ&q&adurl&ved=2ahUKEwjC3ceTucfsAhXBeisKHatlBewQ0Qx6BAgfEAE

		POs												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1						-	1			3	2	2	2			
CO2							1			3	2	2	2			
CO3							1			3	2	2	2			
CO4							1			3	2	2	2			
CO5							1	i i		3	2	2	2			
	3		High	-		2 Medium					1	Lo	w			

			Summative	assessment		
			Continuous	Assessment		Final
Bloom's		The	eory Marks		Practical	(Theory)
Lever	IAE-I [7.5]	IAE-II [7.5]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	[50 marks]
Remember	20	20	20		40	40
Understand	20	20	20		40	40
Apply	10	10	10		20	20
Analyze						
Evaluate						
Create						

00511500	Advanced Communicative English	L	Т	Ρ	С
20ENE02	(Common to all B.E./ B.Tech Programmes)	2	0	2	3
Nature of Course	Humanities and Social Sciences			-	9
Pre requisites	Basics of Communicative English				

#### **Course Objectives**

The course is intended to

- 1. Demonstrate satisfactory control over complex structures and mechanics in English.
- 2. Develop fluency and accuracy in oral communication.
- 3. Communicate effectively and actively in social interactions.
- 4. Read Englishat inspectional level.
- 5. Face interviews with confidence.

## **Course Outcomes**

On successful completion of the course, students will be able to

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CO. No	Course Outcome	Bloom's Level
CO1	Apply knowledge of English grammar for effective communication	Remember
CO2	Make use of common English phrases and vocabulary strength.	Understand
CO3	Build self-confidence and enhance professionalism	Apply
CO4	Implement listening, reading and writing skills in real - life situations	Apply
CO5	Speak fluently in English with proper pronunciation, intonation, tone and accent.	Understand

#### **Course Contents**

## Unit – IGrammar and usage

Active voice and passive voice - Prefixes and suffixes - Connotation - Clauses - If conditionals -Idioms & Phrases - Right forms of verbs-- Modal Auxiliaries - Spotting errors.

## Unit - II Lexical competence

Technical Vocabulary- Expressions - Frequency - Cause and effect - Words often Miss-spelled -6 Syntax and structure - Homophones and Homonyms- Verbal analogy - Idioms and Phrases.

## Unit - III Conversational etiquette

Processes description- Tone and accent in speech- Role-play (Job-Interview) - Presentation skills - Mechanics of presentation - Telephone etiquette - Group Discussion strategy - Formal & Informal subjective and objective introduction - Body Language - Mock Interview.

## Unit – IVListening reading and writing

Listen to Scientific/Technical talks and gap filling - Listening to TED/INK Talks - Reading - "Water: The Elixir of Life" by Sir. C.V.Raman. "Progress" by St. John Ervine - Instructions and Recommendations - Letter writing formal -Job application- Report writing-Introspective report -Creative writing - Essays and Paragraphs.

## Unit - VPhonetics

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Production and classification of speech sound - International Phonetic Alphabet and transcriptions -Phonological rules - way and Place of articulation - Vowels, consonants and diphthongs. Specific characteristics feature of vowel sounds.

S.No	List of Exercises	CO Manning	DDT
1	Role-play – Processes Description	2	Remember
2	Listening to TED/INK Talks and gap filling	4	Understand
3	Group Discussion	3	Understand
4	Articulation with pronunciation practice	3	Apply
5	Reading – Longer texts and Technical Articles (Skimming & Scanning).	4	Apply
6	Presentation skills - Mechanics of presentation	5	Understand
7	Individual presentation on given topics	5	Remember
8	Telephone etiquette	5	Understand
9	Instructions and Recommendations	5	Remember
10	Writing - General Essays.	4	Apply
11	Report writing technique- write up		Remember

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## Total: 30Periods

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		Total:	30 Periods
15	Body Language	3	Understand
14	Job Interviews(Role play)	3	Apply
13	Model Job Interviews	3	Understand
12	Introspective report – Personal analysis	4	Understand

#### **Text Books**

- 1. Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 5<sup>th</sup> Edition, 2007,
- Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 5<sup>th</sup> Edition, 2000.
- Board of Editers, "Using English A Coursebook for Undergraduate Engineers and Technologists", Orient BlackSwan Private Limited, Hyderabad, 2<sup>nd</sup> Edition, 2017.

#### Reference Books:

- Raman M &Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 10<sup>th</sup> Edition, 2007.
- John CunnisonCatford, "A Practical Introduction to Phonetics", Clarendon Press, Jamaica, 2<sup>nd</sup> Edition, 2001.
- Norman Whitby, Business Benchmark "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1<sup>st</sup> Edition, 2006.
- DhanavelS. P., "English and Soft Skills", 1<sup>st</sup>Edition,OrientBlackSwan Private Limited, Hyderabad, 1<sup>st</sup> Edition, 2010.

#### Web reference:

- https://www.coursera.org/lecture/tesol-speaking/video-2-listening-strategies-for-learners-3AeBL?utm\_source=mobile&utm\_medium=page\_share&utm\_content=vlp&utm\_campaign= top\_button
- 2. blob:https://www.youtube.com/73f7256d-d302-4563-bed5-9e84c94a26ac

Map	ping	of Cou	irse O	utcom	es (CC	D) with Out	Prog	ramma s (PSC	e Outc	omes	(PO) F	rogra	mme S	Specif	īc
COs		Pos													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1										3	1	2	2		1
CO2										3	1	2	2		
CO3				_						3	1	2	2		
CO4						-				3	1	2	2		-
CO5										3	1	2	2		-
	3 High					2		Medium					Low		

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alson into a	-		Summative	assessment	and the second second	
		Final				
Bloom's Level		Theo	ory Marks	Practical	(Theory)	
	IAE-I [7.5]	IAE-II [7.5]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	[50 marks]
Remember	20	20	20	100 ET ET ET	40	40
Understand	20	20	20		40	40
Apply	10	10	10		20	20
Analyse						
Evaluate						
Create						

20MA203		Mathematics – Il for Computing Sciences	L	Т	Ρ	С
		(Common to CSE, IT and AI & DS)	3	2	0	4
Nature of (	Course	Basic Sciences		_	11 3	
Prerequisi	tes	Fundamentals of Calculus and Algebra			_	

#### **Course Objectives**

The course is intended to

1. Incorporate the functions of several variables, Taylor's series expansion, Jacobins, maximum & minimum values.

2. Introduce the basic notions of groups, rings, fields which will then be used to solve related problems.

- 3. Learn the concepts of rings, finite fields and polynomials.
- Acknowledge the basic concepts in number theory.
- 5 Acquire the concepts of Laplace transform and its inverse.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Analyze functions of two variables with their visualization, compute their limits, continuity, derivatives and extreme values	Analyze
CO2	Apply the basic notions of groups, rings, fields and to solve their engineering problems	Apply
СОЗ	Explain the concepts of advanced algebra and identify their role in modern mathematics.	Understand
CO4	Demonstrate accurate and efficient use of advanced algebraic techniques.	Understand
CO5	Find Laplace transform of standard functions and solve initial value problems / differential equations using Laplace transforms	Apply

#### **Course Contents:**

#### UNIT - I Functions of Several Variables

12

12

Functions of two variables -Limits and Continuity-Partial derivatives - Euler's theorem for homogenous functions -Differentiation of implicit functions -Jacobians-Taylor's expansion - Maxima and Minima - Lagrange's Method of Undetermined Multipliers.

#### UNIT – II Groups and Rings

Groups: Definition - Properties - Homomorphism - Isomorphism - Cyclic groups - Cosets -Passed in Board of studies Meeting on 23.10.2020 Approved in Academid Council Meeting on 06.11.2020

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Lagrange's theorem. Rings: Definition - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism.

#### UNIT – III Finite Fields and Polynomials

Rings - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.

#### UNIT – IV Divisibility Theory and Canonical Decompositions

Division algorithm – Base representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

#### UNIT – V Laplace Transforms

Laplace transform –Transform of elementary functions –Properties –Transforms of derivatives and integrals -Transform of periodic functions. Inverse Laplace transform –Statement and applications of Convolution theorem –Initial and Final value theorems –Method of solving second order ordinary differential equations with constant coefficients by using Laplace transform technique.

**Total: 60 Periods** 

#### Text Books:

- 1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44<sup>th</sup> Edition, 2019.
- 2. Grimaldi, R.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Publishers, 5<sup>th</sup> Edition, 2007.

#### **Reference Books:**

- 1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 1<sup>st</sup> edition, 2017.
- Bali.N.P and Dr.ManishGoyal A text book of Engineering Mathematics", Laxmi Publications (P)LTD, 8<sup>th</sup>edition,2011.
- 3. Lidl, R. and Pitz, G, "Applied Abstract Algebra", Springer Verlag Publishers, 2<sup>nd</sup> Edition, 2006.
- 4. Niven, I., Zuckerman.H.S., and Montgomery, H.L., -An Introduction to Theory of Numbersl, John Wiley and Sons Publishers, 2<sup>nd</sup> Edition, 2004

#### Additional References:

- 1. nptel.ac.in/courses/111/105/111105134
- 2. nptel.ac.in/courses/122/104/122104017

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

0		Pos												PSOs			
Cos	1	2	3	4	5	6	7	8	9	10	11	12	1	1 2 3			
CO1	3	2	2										1				
CO2	3	2	2										2				
CO3	3	3	2						_				2				
CO4	3	2	3										2	) KOL			
CO5	2	3	2										1	and the second			
	31	High	1	-	6	21	Medi	um	1		-	1	Low				

Formative a	ssessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	15

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#### Summative Assessment

Bloom's Category	Internal	Assessment E		
bioom's category	IAE1 (7.5)	IAE2 (7.5)	IAE3 (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze	-			
Evaluate				
Create				

2005202	PROGRAMMING AND DATA STRUCTURES	L	Т	Ρ	С
LOOGLUE	(Common to CSE, IT and AI)	3	0	0	3
Nature of Course	Professional Core	10-0			
Pre requisites	Basics of C				

#### **Course Objectives**

The course is intended to

- 1. Learn the features of C
- 2. Gain Knowledge in linear and non-linear data structures
- 3. Explore the applications of linear and non-linear data structures
- 4. Represent data using graph data structure
- 5. Learn the basic sorting and searching algorithms

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Determine the basic concepts and terminology of programming in C	Understand
CO2.	Interprets the concept of functions, pointers, structures and unions operations and their usage.	Understand
CO3.	Implement linear data structure operations using C	Apply
CO4.	Suggest appropriate linear / non-linear data structure for any given data set	Apply
CO5.	Appropriately choose the searching and sorting algorithm for an application	Apply

## **Course Contents:**

#### Unit - I C Programming Basics

Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting-searching – matrix operations.

# Unit - IIFunctions, Pointers, Structures and Unions9Functions - Pass by value - Pass by reference - Recursion - Pointers - Definition - Initialization -<br/>Pointers arithmetic. Structures and unions - definition - Structure within a structure - Union -<br/>Programs using structures and Unions - Storage classes, Pre-processor directives

#### Unit - III Linear Data Structures

Arrays and its representations - Stacks and Queues - Linked lists - Linked list-based

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implementation of Stacks and Queues - Evaluation of Expressions - Linked list based polynomial addition.

#### Unit - IV **Non-Linear Data Structures**

9 Trees - Binary Trees - Binary tree representation and traversals -Binary Search Trees -Applications of trees. Set representations – Union-Find operations. Graph and its representations – Graph Traversals.

#### Unit - V Searching and Sorting Algorithms

Linear Search - Binary Search. Bubble Sort, Insertion sort - Merge sort - Quick sort - Hash tables Overflow handling.

#### Text Books:

**Total: 45 Periods** 

9

- 1. Pradip Dey and Manas Ghosh, -Programming in C, Second Edition, Oxford University Press, 2011.
- Ellis Horowitz, Sartaj Sahni, Susan AndersonFreed, "Fundamentals of Data Structures in C". Second Edition, University Press, 2008.

#### **Reference Books:**

- 1. Mark Allen Weiss, -Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
- 2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, -Data Structures and Algorithms, Pearson Education, 1983.
- 3. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, Data Structures and Program Design in C, Second Edition, Pearson Education, 2007
- 4. Jean-Paul Tremblay and Paul G. Sorenson, -An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, 1991.

Ма	pping	of Co	urse (	Dutco	mes (( Spe	COs) v cific (	with P Dutcoi	rograi mes (F	nme ( PSOs)	Outco	mes (F	POs) P	rogra	mme	
				-		P	Os						F	<b>PSOs</b>	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	
CO2	3	2	2	1									3	1	
CO3	3	2	1	1							2		3	1	
CO4	3	3	2	1				-					3	1	
CO5	3	3	2	2	04			-1		-	-	_	3	1	
11 6	3	1	Hi	gh		2		Mec	lium		1		Lo	w	

Formative assessment						
Bloom's Level	Assessment Component	Marks	Total marks			
Apply	Classroom or Online Quiz	5				
Understand	Class Presentation/Power point presentation	5	15			
	Attendance	5 /				

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	Summa	ative Assessme	nt	0
	Continu	ious Assessme	nt Tests	Final
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	20	40
Apply	20	20	20	50
Evaluate	0	0	0	0
Create	0	0	0	0

20CH201	CHEMISTRY FOR COMPUTER SCIENCES (Common to CSE, IT and Al&DS)	L 3	T O	P 2	C 4
Nature of Course	Basic Sciences	- ×	-		A1
Prerequisites	Nil				

The course is intended to

- 1. Impart knowledge and understanding about the constituents present in water and the need for purification of water.
- 2. Understand the fundamentals of batteries.
- 3. Provide knowledge about materials like metals, refractories and cement.
- 4. Develop the understanding and applications of basic concepts ofelectrochemistry.
- 5. Conversant with the basics of polymers and engineeringplastics.

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand	Apply
CO2	Understand the basic principles and mechanism of working of batteries and fuel cells	Understand
CO3	Discuss about various types of alloys and engineering materials	Understand
CO4	Use the principles of electro chemical cells, EMF, electroplating and electrolysis	Apply
CO5	Classify engineering plastics and some important industrial polymers	Understand

#### **Course Contents**

#### Unit-I Water Analysis and Water Treatment

Water analysis: Sources of water, Hard water and soft water, Hardness of water, acidity, alkalinity, pHvalue, amount of free CO<sub>2</sub>, fluoride content and chloride content. Biological Oxygen Demand (BOD), Chemical Oxygen Demand(COD). Water treatment: Definition, Zeolite process, Conditioning methods: Internalconditioning (Phosphate, Calgon) and external conditioning (Demineralisation), Desalination, Reverseosmosis(RO).

#### Unit-II Energy Storage Devices

Batteries:Definition, characteristics and classification, Primary battery: Alkaline battery, Secondary battery: lead acid battery, nickelcadmium battery, lithium battery and lithium ionbattery, Fuel cells: construction and working ofphosphoric acid fuel cell.

#### Unit-III Alloys and Engineering Materials

Alloys: classification and types, Ferrous alloys (Nichrome and stainless steel only), Non- ferrous

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alloys (brass and bronze), Heat treatment of steel, Refractories:characteristics, classification and manufacture.Cement: manufacture and setting.

#### Unit-IV Electrochemistry

9

Electrodepotential, Nernstequationandproblems, Referenceelectrodes, Standardhydrogen electrode, Calomelelectrode, Ionselectiveelectrode(glasselectrode), Determination of pHbyglasselectrode, Electrochemical series, Electrochemical cell, Galvanic cell: measurement of EMF.

#### Unit-V Polymeric Materials

Engineering plastics: Thermosetting and Thermoplastics, Polymers: polyethylene (PE), polyvinylchloride, Teflon, nylon-6.6, Fabrication: injection moulding, Composites: definition, types, polymer matrix composites, FRP, Biodegradable polymers: definition. Polylactide acid: production, properties and applications.

Total: 45Periods

#### Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of hardness of water	CO1	Apply
2	Determination of chloride content in water sample	CO1	Apply
3	Conductometric titration of strong acid versus strong base	CO2	Understand
4	Determination of strength of HCI by pH metry	CO2	Understand
5	Estimation of copper in brass by EDTA method	CO3	Apply
6	Determination of CaO in cement	CO3	Apply
7	Estimation of strength of iron by potentiometric titration	CO4	Apply
8	Determinationofmolecular weightofagivenpolymerbyOstwald viscometer	CO5	Apply

#### **Text Books**

- 1. O.G.Palanna, "Engineering Chemistry", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1<sup>st</sup> Edition, 2017
- 2. P.C.Jain and Monicka Jain, "Engineering Chemistry", DhanapatRai Publishing Company Pvt. Ltd, 2<sup>nd</sup> Edition, 2017.

#### Reference Books

1. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi,2<sup>nd</sup> Edition, 2009.

2. R. Sivakumar and N. Sivakumar, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1<sup>st</sup> Edition, 2009.

3. Dr.Sivanesan and Nandagopal, "Engineering Chemistry-I" V. K. Pub. Pvt. Ltd,2<sup>nd</sup> Edition, 2011.

#### **Additional Resources**

- 1 https://nptei.ac.in/downloads/122101001
- 2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf
- 3. https://nptel.ac.in/courses/102103044/3
- 4. https://www.sciencedirect.com/topics/chemistry/phosphoric-acid-fuel-cells
- 5. https://en.wikipedia.org/wiki/Polylactic acid

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COs		18				P	Ds							PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2			0.0						1				
CO2	3	2									1		per-		
CO3	3	2								-	1				
CO4	3	2		-							1		5		
CO5	3	1		-							1				
	3		High			2		Mediur	n		1		Low		

Summative Assessment								
	Theory					Final		
	IAE-I [7.5]	IAE-II [7.5]	IAE-III[10]	Attendance [5]	Rubric based CIA [20]			
Remember	30	20	10		20			
Understand	10	20	30		20	-		
Apply	10	10	10		10			
Analyze						-		
Evaluate								
Create								

		L	Т	Р	С
20ME203	Engineering Graphics	1	0	4	3
Nature of Course	Engineering Sciences			_	_
Pre requisites	Nil		_	_	_

#### Course Objectives:

The course is intended to

- 1. Understand technical drawings in various fields of engineering
- 2. Imagine and visualize the geometric details of engineering objects.
- 3. Translate the geometric information of engineering objects into engineering drawings.
- 4. Develop the graphical skills for communication of concepts, ideas and design of engineering

products through technical drawings.

# 5. Visualize and draw isometric and perspective views

#### **Course Outcomes**

On successful completion of the course, students will be able to

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CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the conic sections, special curves, and draw orthographic views from pictorial views.	Apply
CO 2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.	Apply
CO 3	Construct the projections of simple solids like prisms, pyramids, cylinder and cone.	Apply
CO 4	Build the sectional views of solids like cube, prisms, pyramids, cylinders & cones and development of its lateral surfaces	Apply
CO 5	Organize and draw isometric and perspective sections of simple solids.	Apply

#### **Course Contents**

#### Concepts and Conventions (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning.

#### UNIT -I Plane Curves and Free Hand Sketching

Basic Geometrical constructions, Curves used in engineering practices: Conics -Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid construction of involutes of square and circle - Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects - Layout of views- Free hand sketching of multiple views from pictorial views of objects

#### UNIT -II Projection of Points, Lines and Plane Surfaces

Orthographic projection- principles-Principal Planes-First angle projection-projection of points Projection of straight lines (only First angle projections) inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

#### UNIT -III **Projection of Solids**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

#### UNIT- IV Projection of Sectioned Solids and Development of Surface

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section, Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

#### UNIT-V **Isometric and Perspective Projections**

Principles of isometric projection - isometric scale -Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

#### TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011

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## (3+12)

(3+12)

#### (3+12)

(3+12)

(3+12)

TOTAL: (15+60) Periods

 Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.

#### **REFERENCE BOOKS**

1 Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> Edition, 2010.

2. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

3. ParthasarathyN S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

#### Web References

1. http://nptel.ac.in/courses/112103019/Engineering drawing

2. http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

#### Publication of Bureau of Indian Standards

1. IS 10711 - 2001: Technical products Documentation - Size and lay out of drawingsheets.

2. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.

3. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.

4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

5. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.

#### Special points applicable only to Final Examinations of Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.

2. All questions will carry equal marks of 20 each making a total of 100.

3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

4. The examination will be conducted in appropriate sessions on the same day

		POs										PSOs			
COs -	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2			-							1	2		
CO2	3	2										1	2		
CO3	3	2										1	2		
CO4	3	3										1	2		
CO5	3	2								-		1	2		
	3		Hi	gh		2		Med	dium		1		L	ow	

			Summative	assessment	Concerning of the	
		Final				
	-	Theory Practical				
Bloom's Level	IAE-I [7.5]	IAE-II [7.5]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	n (Theory) [50 marks]
Remember	10	10	10		20	20
Understand	20	20	20		40	40
Apply	20	20	20		40	40

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Analyse	1			
Evaluate				
Create				

20CS203	PROGRAMMING AND DATA STRUCTURES LABORATORY (Common to CSE , IT and AI)	L 0	Т 0	P 4	C 2
Nature of Course	Practical				
Pre requisites	Basic Structure of C Program			_	_

### **Course Objectives**

The course is intended to

- 1. Make familiar with C programming Language
- 2. Write simple programs using arrays and pointers
- 3. Develop applications in C using functions and structures
- 4. Implement linear data structure List ADT in various applications
- 5. Apply Stack and Queue ADTs using C in real time applications

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Write simple C programs using basic language constructs	Understand
CO2	Solve problems using arrays and strings	Apply
CO3	Develop modular programs using functions, pointers and structures	Apply
CO4	Implement various List ADTs for various applications	Apply
CO5	Make use of Stack and Queue ADT to solve real-time problem	Analyze

## **Course Content:**

S.No	List of Exercises	CO Mapping	RBT
1	Write programs using simple control statements	C01	Understand
2	Write a program to implement functions and recursive functions.	CO1	Understand
3	Design and develop a health application that computes indexes and suggest the diet plan.	CO2	Analyze
4	Program to do simple operations with arrays and strings.	CO2	Apply
5	Implement a telephone directory using structures and pointers.	СОЗ	Analyze
6	Choose an appropriate data structures and create a token system for banking service.	СОЗ	Analyze
7	Choose an appropriate data structures and create a book rack allocation system in a library.	CO4	Apply
8	Create a C application to get employee information	CO4	Apply

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9	Creation of Array and linked list implementation of Stack and Queue ADTs	CO5	Apply
10	Create a food delivering system which allocates the path for delivery of food using appropriate data structures.	CO5	Apply

Мар	ping o	of Cou	irse C	utco	nes (( Spe	COs) v cific (	with P Dutcoi	rograr mes (F	nme ( PSOs)	Dutcoi	nes (F	POs) P	rogra	mme	
00-	POs												Р	SOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2									2	3	T
CO2	3	3	3	2						1			2	3	
CO3	3	3	3	2							_		2	3	
CO4	3	3	3	2									2	3	
CO5	3	3	3	3									2	3	
	3		Hi	gh		2		Med	ium		1		Lov	N	

Summative assessm	ent based on Continuous and En	d Semester Examination
Bloom's Level	Rubric based Continuous Assessment [50 marks]	Final Examination [50 marks]
Remember		
Understand	10	30
Apply	20	50
Analyze	20	20
Evaluate		
Create		

00140000		L	T	P	C
201010202	INTERPERSONAL SAILLS	2	0	2	0
Nature of Course	Mandatory, Non Credit		-		
Pre requisites	Nil				

# **Course Objectives**

The course is intended to

- 1. Use interpersonal communication skills to influence and build good relationships.
- 2. Identify and pursue personal learning goals.
- 3. Obtain feedback skills in service of evolving learning goals.
- 4 Learn about group dynamics, behaviors and feelings
- 5. Enhance the communication process in both formal and informal contexts

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	<b>Bloom's Level</b>
CO1	Practice interpersonal communication skills to influence and build good relationships	Understand
CO2	dentify and pursue personal learning goals.	Understand
CO3	Give evident feedback	Understand
CO4	Reveal group dynamics and amiable behavior	Understand
CO5	Emphasis the communication process	Understand

#### Course Contents:

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Approved in Academic Council Meeting on 06.11.2020

**CHAIRMAN - BOARD OF STUDIES** 

#### Unit I: Fundamentals of Interpersonal Communication

Facts of communication and Interpersonal communication – culture and gender – Communication and Self disclosure – Presentation of Interpersonal perception - Learning goals – Feeling and feedback.

#### Unit II: Interpersonal communication in action

Nature of language - language and culture - usage and abuse of language --Positive communication -Non verbal communication - Listening strategies -- Barriers of listening.

#### Unit III: Emotional Intelligence

Influence of emotional experience and expressions – Accepting the responsibilities and changes - Negotiation tactics - Dealing with criticism and appreciation - Collaborative Problem Solving - Resilience Building.

#### Unit IV: Transactions

Different types of transactions - Building Positive Relationship - Managing Conflict – Connecting across Difference – Factors hampering Interpersonal interactions – Assertiveness in communication.

#### Unit V: Essential Interpersonal Competencies

Behaviour – Understanding limiting behaviour - Interpersonal and small group behavior – Critical and lateral thinking-Win –Win attitude – Positive thinking – Stress management – Assertive feedback - Personal Evaluation of Interpersonal Relationship Skills

## **Total 30 Periods**

#### Activity Component

S.No	Name of the Exercises	CO Mapping	RBT
1	Self-Introduction	1	Remember
2	Presentation of Individual perception	2	Understand
3	Role play - Non-verbal communication - Body language	4	Apply
4	Role play - Interpersonal interactions & Assertive feedback	3	Remember
5	Group Discussion	4	Apply
6	Role play - Situational conversation ( On spot )	5	Understand

#### Text Books

1. Bozeman, Jeanine C and Argile Smith, "Interpersonal Relationship Skills for Ministers" Gretna, LA: Pelican Publishing Company, 1<sup>st</sup>Edition, 2004.

2. Floyd, Kory, "Interpersonal Communication", 2d. Boston: McGraw-Hill, 2<sup>nd</sup> Edition, 2011.

#### **Reference Books:**

CHAIRMAN - BOARD OF STUDIES

1. Augsburger, David, "Caring Enough to Confront How to Understand and Express Your Deepest Feelings Towards Others", updated ed. Ventura, CA: Regal Books, 2<sup>nd</sup> Edition2009. 2. Vohs, Kathleen D., and Eli J., Finkel, eds, "Self and Relationships: Connecting Intrapersonal and Interpersonal Processes", New York: Guilford Press, 1<sup>st</sup> Edition, 2006.

Passed in Board of studies Meeting on 23.10.2020

Approved in Academic Council Meeting on 06.11.2020

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COs	Pos													<b>PSOs</b>	
	1	2	3	4	5	6	7	8	9	10	11	12	1.0	2	3
CO1										3	2	1	2	~	-
CO2						1.2		-	-	2	2	1	2		-
CO3				-	-		-	_	-	2	2	4	2		_
CO4		-	-		-				-	3	2		2		_
004								_	-	3	2	1	2	-	_
COS	-	1		_	1	1	_			3	2	1	2		
	3	3 High 2 Medium 1							ow						

Bloom's Level	Summative Asse	essment (Internal Mode)
	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)
Remember	20	20
Understand	10	10
Apply	20	20
Analyze		
Evaluate		
Create		

20ENE02	Advanced Communicative English	L	T	P	С
	(Common to all B.E./ B.Tech Programmes)	2	0	2	3
Nature of Course	Humanities and Social Sciences		-	-	
Pre requisites	Basics of Communicative English	-	-	_	

## **Course Objectives**

The course is intended to

- 1. Demonstrate satisfactory control over complex structures and mechanics in English.
- 2. Develop fluency and accuracy in oral communication.
- 3. Communicate effectively and actively in social interactions.
- 4. Read English at inspectional level.
- 5. Face interviews with confidence.

#### Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Apply knowledge of English grammar for effective communication	Remember
CO2	Make use of common English phrases and vocabulary strength.	Understand
СОЗ	Build self-confidence and enhance professionalism	Apply
CO4	mplement listening, reading and writing skills in real - life situations	Apply
CO5	Speak fluently in English with proper pronunciation, intonation, tone and accent.	Understand

#### **Course Contents**

#### Unit – I Grammar and usage

Active voice and passive voice – Prefixes and suffixes – Connotation – Clauses - If conditionals – Idioms & Phrases - Right forms of verbs– Modal Auxiliaries - Spotting errors.

### Unit - Il Lexical competence

Technical Vocabulary- Expressions - Frequency - Cause and effect - Words often Miss-spelled -

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Syntax and structure - Homophones and Homonyms- Verbal analogy - Idioms and Phrases.

#### Unit - III Conversational etiquette

Processes description- Tone and accent in speech- Role-play (Job-Interview) - Presentation skills - Mechanics of presentation - Telephone etiquette - Group Discussion strategy - Formal & Informal subjective and objective introduction - Body Language - Mock Interview.

# Unit - IV Listening reading and writing

Listen to Scientific/Technical talks and gap filling – Listening to TED/INK Talks – Reading – "Water: The Elixir of Life" by Sir. C.V.Raman. "Progress" by St. John Ervine - Instructions and Recommendations – Letter writing formal –Job application- Report writing–Introspective report – Creative writing – Essays and Paragraphs.

## Unit – V Phonetics

Production and classification of speech sound – International Phonetic Alphabet and transcriptions – Phonological rules – way and Place of articulation – Vowels, consonants and diphthongs. Specific characteristics feature of vowel sounds.

S.No	List of Exercises	CO Mapping	RBT
1	Role-play - Processes Description	2	Remember
2	Listening to TED/INK Talks and gap filling	4	Understand
3	Group Discussion	3	Understand
4	Articulation with pronunciation practice	3	Apply
5	Reading – Longer texts and Technical Articles (Skimming & Scanning).	4	Apply
6	Presentation skills – Mechanics of presentation	5	Understand
7	Individual presentation on given topics	5	Remember
8	Telephone etiquette	5	Understand
9	Instructions and Recommendations	5	Remember
10	Writing – General Essays.	4	Apply
11	Report writing technique- write up	4	Remember
12	Introspective report – Personal analysis	4	Understand
13	Model Job Interviews	3	Understand
14	Job Interviews(Role play)	3	Apply
15	Body Language	3	Understand

#### Text Books

**CHAIRMAN - BOARD OF STUDIES** 

- Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 5<sup>th</sup> Edition, 2007.
- 2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 5<sup>th</sup> Edition, 2000.
- Board of Editers, "Using English A Coursebook for Undergraduate Engineers and Technologists", Orient BlackSwan Private Limited, Hyderabad, 2<sup>nd</sup> Edition, 2017.

Approved in Academic Gouncil Meeting on 06.11.2020

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Total: 30Periods

Passed in Board of studies Meeting on 23.10.2020

#### **Reference Books:**

- Raman M &Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 10<sup>th</sup>Edition, 2007.
- 2. John CunnisonCatford, "A Practical Introduction to Phonetics", Clarendon Press, Jamaica, 2<sup>nd</sup> Edition, 2001.
- Norman Whitby, Business Benchmark "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1<sup>st</sup> Edition, 2006.
- 4. DhanavelS. P., "English and Soft Skills", 1<sup>st</sup>Edition,OrientBlackSwan Private Limited, Hyderabad, 1<sup>st</sup> Edition, 2010.

#### Web reference:

- https://www.coursera.org/lecture/tesol-speaking/video-2-listening-strategies-for-learners-3AeBL?utm\_source=mobile&utm\_medium=page\_share&utm\_content=vlp&utm\_campaign= top\_button
- blob:https://www.youtube.com/73f7256d-d302-4563-bed5-9e84c94a26ac

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO) Pos **PSOs** COs 1 2 7 3 4 5 6 12 2 8 9 10 11 1 3 CO1 3 1 2 2 CO2 1 2 2 3 CO3 1 2 2 3 CO4 3 1 2 2 CO5 3 1 2 2 3 Hgh 2 Medium 1 Low

			Summative	assessment		
		Final				
Bloom's Level		Theo	ory Marks	Practical	Examination (Theory)	
	IAE-I [7.5]	IAE-II [7.5]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	[50 marks]
Remember	20	20	20		40	40
Understand	20	20	20		40	40
Apply	10	10	10		20	20
Analyse					the second se	
Evaluate						
Create					Constant of the	

Passed in Board of studies Meeting on 23.10.2020

Approved in Academic Council Meeting on 06 11.2020



20ENE03	HINDI	L 2	Т 0	P 2	С З
Nature of Course	Humanities and Social Sciences		<u> </u>	2000	
Pre requisites	Basic Perceptive of Language				

#### **Course Objectives**

The course is intended for learners.

- 1. To help students acquire the basics of Hindi
- 2. To teach them how to converse in Hindi on simple day-to-day situations
- 3. To help students acquire the ability to understand a simple technical text in Hindi

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO.1	Construct simple sentences and use vocabulary required for day-to- day conversation	Remember
CO 2	Distinguish and understand the basic sounds of Hindi language.	Remember
CO.3	Appear for Hindi examinations conducted by Dakshin Bharat Hindi PracharSabha.	Remember

#### **Course Contents:**

#### **UNIT I: Introduction**

Hindi Alphabet: Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - owel Signs- Chandra Bindu & Visarg - Table of Alphabet - Vocabulary.

#### UNIT II: Reading

Nouns: Genders (Masculine & Feminine Nouns long vowels and short vowels - -Masculine & Feminine - Reading Exercises

#### UNIT III: Grammar

Pronouns and Tenses: Categories of Pronouns - Personal Pronouns - Second person you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense - Assertive & Negative Sentences – Interrogative Sentences.

#### UNIT IV: Vocabulary

Classified Vocabulary: Parts of body - Relatives - Spices - Eatables - Fruit & Vegetables - Clothes - Directions - Seasons - Professions

#### **UNIT V: Speaking**

Speaking: Model Sentences and Rhymes - Speaking practice for various occasions.

**Total: 30 Periods** 

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#### **Reference:**

- 1. Hindi Prachar Vahini-1 by Dakshin Bharat Hindi Prachar Sabha Chennai
- 2. B.R.Kishore, Self Hindi Teacher for Non-Hindi Speaking People,
- VeeKumar Publications(P)Ltd., NewDelhi,2009
- 3. Videos, Stories, Rhymes and Songs.

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20FNE04	FRENCH	L	Т	P	C
	TREACH	2	0	2	0
Nature of Course	Humanities and Social Sciences				
Pre requisites	Basic Perceptive of Language	1000			

# **Course Objectives**

The course is intended for learners.

- 1. To prepare the students for DELFA1Examination
- 2. To teach them to converse fluently in French in day-to-day scenarios

#### Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	To help students acquire familiarity in the French alphabet &basic vocabulary	Remember
CO2	listen and identify individual sounds of French	Remember
СОЗ	Use basic sounds and words whiles peaking	Remember
CO4	Read and understand short passages on familiar topics	Understand
CO5	Understand and use basic grammar and appropriate vocabulary in completing language tasks	Understand

#### **Course Contents:**

#### UNIT I : Entrer En Contact

La langue francaise, alphabets, les numeros, les jours, les mois. Grammaire Les verbes s'appeler, etre, avoir, les articles definis, indefinis Communication - Saluer, s''informer sur quelquun, demander de se presenter Lexique - Les alphabets, les nationalites, age, les pays, les couleurs, les jours de la semaine, les mois de l'annee, les professions

#### UNIT II :Partager Son Lieu De Vie

Lesfrancaisetleur habitat, des habitation s in solitesGrammaire- Verbes - Conjugaison : Present (Avoir / etre / ER, IR, RE : RegulieretIrregulier) --AdjectifsIdelieuCommunication -Chercher un logement, d'ecrire son voisin, s''informersur un logementLexique - L''habitat, les pieces, l''equipement, la descriptionphysiqu

#### UNIT III: Vivre Au Quotidien

Grammaire - Articles contractes, verbesvouloir, pouvoir, devoir, adjective interrogative, future proche Communication- Exprimersesgouts, parler de sesloisirs, justifier un choix, exprimeruneenvieLexique - le temps libreet les loisirs, les saisons, les activitesquotidiennes, le temps (lematin, le soir, lanuit)

# UNIT IV: Comprendre Son Environment Ouvrir La Culture

Grammaire - Verbes- Finir, Sortir, les adjectifsdemonstratifs, le passe compose, l'imparfait Communication - Propose a $\tilde{A}f$ ? $\tilde{A}$ , $\hat{A}$ quelqu'''un de faire quelque chose, raconteur une sortie au passeparlerunfilmLexique - Les sorties, la famille, art, les vetementsetlesaccessoires

Passed in Board of studies Meeting on 23.10.2020

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#### UNIT V: Gouter ALa Campagne

Grammaire La forme negative, les verbesacheter, manger, payer, articles partitifs, le pronomen de quantite Communication Accepter et refuse rune invitation, donner des instructions, commander au restaurant Lexique Les services et les commerces, les aliments, les ustensiles, argent.

Total: 30 Periods

COs		PO												PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1		2	3	
CO1								i i		2							
CO2						1				2						-	
CO3										3	0 -						
CO4										3							
CO5										2							
	3		Hi	gh		2		P	Mediu	m		1	Low				
20ENE	100		-		_	GE	DMA	4					E	ÌΤ	P	C	
ZUENE	19					GE	RMA	4	_	_	_		2	0	2	3	
Nature of C	ourse		Hu	maniti	es an	d Soci	al Sci	ences									
Pre requisit	tes		Ва	sic Pe	rcepti	ve of L	angu	age									

#### **Course Objectives**

The course is intended for learners.

- 1. To help students appear for the A1 level Examination
- 2 .To teach them how to converse fluently in German in day-to-day scenarios

#### **Course Outcome**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	listen and identify individual sounds of German	Remember
CO2	use basic sounds and words while speaking	Remember
CO3	read and understand short passages on familiar topics	Remember
CO4	use basic sentence structures while writing	Understand
CO5	understand and use basic grammar and appropriate vocabulary in completing language tasks	Understand

# **Course Contents:**

#### **UNIT | Introduction**

Introduction to German language: Alphabet - Numbers - Greetings - Days and Seasons-Working with Dictionary

#### **UNIT II Pronunciation**

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Nouns - articles - Speaking about one self - Listening to CD supplied with the books, paying special attention to pronunciation

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# **UNIT III Basic Syntax**

Regular & Irregular verbs - Personal pronouns - family - Introduction to type's of sentences

### **UNIT IV Vocabulary**

Question words-Types of Questions - Nominative case- Verb Conjugation - country - nationalities

### **UNIT V: Action Words**

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Verbs - to be & to have - conjugation - Hobbys - Framing basic Questions and answers

**Total: 30 Periods** 

#### Reference(s)

- Kursbuch and Arbeitsbuch, NETZWERK A1 DEUTSCH ALSFREMDSPRACHE, Goyal Publishers & Distributers Pvt. Ltd., NewDelhi, 2015
- Langenscheidt Eurodictionary German English / English German, Goyal Publishers & Distributers Pvt. Ltd., NewDelhi, 2009
- 3 Grundkurs, DEUTSCH LehrbuchHueber Munichen, 2007

	1				-			P	Os				P	SOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				Ť				-		2					Γ
CO2	-	-		-	-					2	-	1			F
CO3	-	1	1						1	3					Γ
CO4	-		-		1	1				3			1		
CO5	-		-			1	-			2					Γ
	3		Hi	gh		2		10	Me	dium		1	Low		

Passed in Board of studies Meeting on 23.10.2020

Approved in Academic Councy Meeting on 06.11.2020



#### SEMESTER III

20MA303	DISCRETE MATHEMATICS AND GRAPH THEORY (Common to CSE, IT and AL& DS)	L	Т	Ρ	С
Nature of Course	Basic Sciences	3	2	0	4
Pre requisites	Fundamentals of Basic Mathematics			-	

# **Course Objectives**

The course is intended to

- 1. Introduce the concepts of mathematical logic for analyzing propositions.
- 2. Learn the basic concepts of combinatorics.
- 3. Provide the concepts of graph theory and solving problems in different fields of study.
- 4. Acquaint with the applications of algebraic structures.
- 5. Learn the concepts and significance of lattices and Boolean algebra in computer science and engineering.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Apply the mathematical arguments for logical connectives	Level
CO2	Identify the techniques of combinatorial analysis	Apply
CO3	Construct the graph theory to solve practical problems	Understand
	Distinguish the proportion of electronic structure in structure in the properties of electronic structure in structure in the properties of electronic structure in the structur	Apply
CO4	fields.	Analyze
CO5	Illustrate the logical notations of lattices and Boolean algebra	Apply

#### **Course Contents:**

# Unit - I Mathematical Logic

12 Propositions - Logical connectives - Compound propositions -Conditional and biconditional propositions- Truth tables - Tautologies and contradictions- Contra positive - Logical equivalences and implications -Normal forms - PCNF and PDNF - Rules of inference-Predicates- Statement functions.

# Unit- II Combinatorics

12 Mathematical induction - Strong induction and well ordering - The basics of counting - The pigeonhole principle - Permutations and combinations - Recurrence relations - Solving linear recurrence relations - Generating functions - Inclusion and exclusion principle and its applications.

# Unit - III Graphs

Graphs and graph models - Graph terminology and special types of graphs - Matrix representation of graphs and graph isomorphism - Connectivity - Euler and Hamilton paths- Coloring- Matchings

### Unit – IV Algebraic Structures

Algebraic systems - Semi groups and monoids - Groups - Subgroups -Homomorphism's -Normal subgroup and cosets -Lagrange's theorem - Definitions and examples of Rings and Fields.

# Unit-V Lattices and Boolean Algebra

Partial ordering - Posets - Lattices as posets - Properties of lattices - Lattices as algebraic systems -12 Some special lattices - Boolean algebra-Definition and Examples.

Passed in Board of studies Meeting 30.06.2021

Approved in Academic Council Meeting 04.10.2021

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# 12

**Total: 60 Periods** 

#### Text Books:

- 1. Rosen, K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill Pub Co. Ltd. New Delhi, 7th Edition, Special Indian Edition 2018.
- 2. Tremblay J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd. New Delhi, Edition 2017

#### **Reference Books:**

- 1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education Asia Delhi, 4th Edition 2019.
- 2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition 2018.
- 3. Narsingh Deo. "Graph Theory with applications to Engineering and Computer Science", Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition 2017.

#### Additional References:

- 1. nptel.ac.in/courses/111/104/111104026
- 2. nptel.ac.in/courses/111/107/111107058

	1				Pos									PSOs		
Cos	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	2	-		-	-	-		-	i i	1	2	-	( <del>4</del>	
<u>CO2</u>	3	3	2	-	14	+	-	-	-	-	-	1	3	4	-	
<u>CO3</u>	3	2	2	-	-	-	-	-	-	-	-	1	1		-	
CO4	2	1	1	-	-	÷.		-	-	-	ж. С	1	1		(e) (e)	
004	2	2	2	-	-	-	-		20	1	1	1	1	-		

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
Onderstand	Attendance	5	

	Summ	ative Assessme	ent	
	Intern	al Assessment E	Examinations	Final Examination
Bloom's Category	IAE – I (7.5)	IAE – II (7.5)	1AE – III (10)	(60)
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyze				
Evaluate				
Create				

Passed in Board of studies Meeting 30.06.2021



Approved in Academic Council Meeting 04.10.2021 CHAIRMAN : ACADEMIC COUNCIL

20CS301	DESIGN AND ANALYSIS OF ALGORITHMS	LTPC
Nature of Course	Professional Core	3 0 0 3
Pre requisites	C Programming	

# **Course Objectives**

The course is intended to

- 1. Identify various algorithm design techniques.
- 2. Impart knowledge on runtime analysis of algorithms.
- 3. Learn the basic of sorting and searching algorithms.
- 4. Solve problems using algorithm design methods such as the greedy method, Divide and conquer, dynamic programming, backtracking and branch and bound.
- 5. Solve NP-hard and NP-complete problems.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's
CO1	Classify the problem types and compare orders of growth to represent	Level
000	Apply and inspect recursive and	Understand
02	mathematical notations.	Apply
CO3	Develop the different types of sorting and soarching election	терну
CO4	Analyze the different techniques in the desire of Q	Apply
0.05	Differentiate algorithms design techniques of ND as	Analyze
	problems.	Analyze

# **Course Contents:**

#### UNIT-I Introduction

Basic concepts of Algorithm - Fundamentals of Algorithmic Problem Solving - Important Problem Types -Fundamentals of the analysis of algorithm efficiency - Analysis Framework - Asymptotic Notations and Basic Efficiency Classes.

#### UNIT - II Mathematical Analysis of Algorithms

Mathematical Analysis of Non-recursive Algorithm - Mathematical Analysis of Recursive Algorithm -Example: Fibonacci Numbers - Empirical Analysis of Algorithms-Algorithm visualization.

#### UNIT-III Brute force and Divide and conquer

Brute Force Strategy: Sequential Search and Brute-force string matching- Divide and conquer: Merge sort, Quick Sort, Depth first Search and Breadth First Search- Closest Pair and Convex-hull problem -

#### UNIT - IV Analysis of Graph Algorithms

Dynamic Programming: Optimal Binary Search Tree, Warshall's and Floyd's Algorithm-Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra Algorithm - Iterative improvement. The Maximum-Flow Problem - Maximum Matching in Bipartite Graphs.

#### UNIT-V Algorithm Design Techniques

P, NP and NP Complete Problems -Backtracking: n-Queens Problem, Hamiltonian Circuit problem. Branch and bound: Assignment, Knapsack and Traveling salesman problem, Approximation algorithms

Passed in Board of studies Meeting 30.06.2021

Approved in Academic Council Meeting 04.10.2021

CHARMAN-ABDAREMORSCHUDIES

#### Total: 45 periods

#### Text Books:

- 1. Thomas H. Coremen, Charles E.Leiserson, Roland L.Rivest and Clifford Stein "Introduction to Algorithms", The MIT Press Cambridge, Massachusetts London PHI Pvt. Ltd., 2nd Edition 2019.
- 2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia Tenth Impression Hub pvt ltd, 3<sup>rd</sup> Edition 2017.

#### **Reference Books:**

- 1. Ellis Horowitz, SartajSahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Universities Press, 2<sup>nd</sup> Edition 2019.
- 2. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education Asia, 3<sup>rd</sup> Edition 2018.
- 3. Aho.A.V, Hopcroft.J.E and Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2<sup>nd</sup> Edition 2016.

#### **Additional References:**

- 1. https://nptel.ac.in/courses/106/106/106106131/
- 2. https://nptel.ac.in/courses/106/101/106101060/
- 3. https://onlinecourses.nptel.ac.in/noc19\_cs47/preview

Марр	oing o	of Cou	rse Ou	tcome	es (CO)	) with l Oເ	Progra	amme ( es (PS(	Dutcoi D)	nes (P	O) and	Progra	amme	Speci	fic
COs	POs												F	PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	
CO2	3	2	1	1									3	1	
CO3	3	3	2	1									3	1	
CO4	3	3	2	1									3	1	
CO5	3	2	2	1						-			3	1	
	3		High			2		Mediur	'n		1		Low		

Formative assessment								
Bloom's Level	Assessment Component	Marks	Total marks					
Remember	Online Quiz	5						
Understand	Tutorial Class / Assignment	5	15					
	Attendance	5						

Summative Assessment										
Pleamie Category	Internal A	ssessment Exa	minations	Terminal Examination						
Bloom's Category	IAE – I (7.5)	IAE - II (7.5)	IAE – III (10)	(60)						
Remember	0	0	0	0						
Understand	10	10	10	20						
Apply	20	20	20	30						
Analyze	20	20	20	30						
Evaluate				20						
Create		· · · · · · · · · · · · · · · · · · ·								

Passed in Board of studies Meeting 30.06.2021

Approved in Academic Council Meeting 04.10.2021



20CS302	OBJECT ORIENTED PROGRAMMING (Common to CSE, IT and AL& DS)	LTPC
Nature of Course	Professional Core	3 0 0 3
Pre requisites Course Objectives	Programming in C and Data Structures	

The course is intended to

- 1. Learn the features of Java
- 2. Gain Knowledge in Classes, Objects and Methods
- 3. Explore the concepts of inheritance and interfaces
- 4. Get detailed knowledge about multithreading and generic programming
- 5. Discover the event driven programming concepts.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's
CO1.	Infer the basic concepts of java programming	Level
CO2.	Solve simple applications by utilizing the ious along	Understand
CO3.	Categorize the principles of exception handling and literaces.	Apply
CO4.	Appraise java programs using generic meaning and I/O streams	Analyze
CO5	Perform real time applications using generic programming and multithreading.	Analyze
000.	r enorm real time applications using event handling concepts.	Apply

# **Course Contents**

#### INTRODUCTION TO JAVA FUNDAMENTALS UNIT I

Features of java - Type Conversion and Casting - Java Collections - Data types and Operators -Operator Precedence and Associativity - Expression - Conditional Statements and Control Structures -Arrays-Handling Strings - Java Classes, Objects, Methods - Constructors - Static and Final Keyword -Java Application Programming.

#### UNIT II INHERITANCE AND INTERFACES

Inheritance basics - Using Super, Method overriding -Abstract Classes - Polymorphism - Interfaces-Multiple Inheritance - this keyword - Garbage Collection- finalize() method -Packages - Access Protection-Importing Packages-Nested and Inner Class-Wrapper Classes-Command Line Arguments

#### UNIT III APPLETS, EXCEPTION HANDLING AND I/O

Applets-Life Cycle - Invoking an Applet - Getting Applet Parameters -Try, catch , finally and throws clause - Catching Multiple Exceptions - User Defined Exceptions- Byte streams - Character streams -Reading and Writing files

#### **UNIT IV** MULTITHREADING AND GENERIC PROGRAMMING

The Java Thread Model-Thread Life Cycle-Thread Class and Runnable Interface-Multiple Threads and 9 Synchronization-Inter Thread Communication-Generic Classes and Methods-Bounded Type Parameters, Parallelism.

#### UNIT V EVENT DRIVEN PROGRAMMING

Graphics Programming- AWT event hierarchy-Container Class-Layouts-Components-Basics of event 9 handling - event handlers and listener interfaces - adapter classes -Mouse, Keyboard actions and events - Difference between AWT and Java Swing

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#### **Total: 45 Periods**

#### Text Books:

- 1. Herbert Schildt, "Java the Complete Reference", Tata McGraw-Hill Education, 10th Edition 2017.
- Cay S. Horstmann and Gary cornell, "Core Java Volume-I Fundamentals", Prentice Hall Pearson education, 10th Edition 2007.

#### Reference Books:

- 1. Paul Deitel and Harvey Deitel," Java How to Program (Early Objects)", Pearson Prentice Hall, 10<sup>th</sup> Edition 2018.
- 2. Timothy Budd," An Introduction to Object-Oriented Programming", Pearson Education, 10<sup>th</sup> Edition 2018.
- 3. Balaguruswamy.E, "Programming with Java", Tata McGraw-Hill Publishers, 3rd Edition 2016.

### Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc19\_cs84/preview
- 2. https://onlinecourses.nptel.ac.in/noc21\_cs03/preview
- 3. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs38/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

CO2	Pos									PSOs					
cos	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1			5							3	1	
CO2	3	2	1										3	-1	
CO3	3	2	2	1			-					1	3	1	
CO4	3	2	2	2								1	3	1	-
CO5	3	2	2	2								1	3	1	
	3	Hig	h			2	Med	dium				1	Low		

Formative assessn	nent		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz	5	marks
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

	Summa	tive Assessmen	it	
Bloom's Category	Interna	Final		
<b>D</b>	IAE – I (7.5)	IAE – II (7.5)	IAE – III (10)	Examination
Remember	10	10	10	20
Understand	20	20	10	20
Apply	20	20	10	50
Analyzo	20	20	20	20
Finallyze	0	0	10	10
Evaluate	0	0	0	0
Create	0	0	0	0
	0	0	0	0

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Approved in Academic Council Meeting 04.10.2021

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20CS303	COMPUTER ARCHITECTURE AND ORGANIZATION	L	1	F	2	С
	(Common to CSE, 11)	3	10	10	0	3
Nature of Course	Engineering Science				-	-
Pre requisites	Computer Hardware		-	-	_	_

#### **Course Objectives**

The course is intended to

- 1. Have knowledge of basic structure and operation of digital computer.
- 2. Be familiarize with implementation of fixed point and floating-point arithmetic operations
- 3. Learn the design of data path unit and control unit for processor
- 4. Establish the parallel processing technique
- 5. Distinguish the organization of various parts of a system memory hierarchy

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Recognize the basic structure of computer, operations and instructions.	Understand
CO2.	Design arithmetic and logic unit.	Apply
CO3.	Design a pipeline for consistent execution of instructions with minimum hazards	Apply
CO4.	Comprehend parallel processing architectures.	Inderstand
CO5.	Manipulate the function of each element in memory and Interfacing	Apply

#### **Course Contents**

#### UNITI BASIC STRUCTURE OF A COMPUTER SYSTEM

Functional Units - Basic Operational Concepts - Performance - Instructions: Language of the Computer - Operations, Operands - Instruction representation - Logical operations - decision making - MIPS Addressing.

#### UNIT II ARITHMETIC FOR COMPUTERS

Addition and Subtraction - Multiplication - Division - Floating Point Representation - Floating Point **Operations – Subword Parallelism** 

#### UNIT III PROCESSOR AND CONTROL UNIT

A Basic MIPS implementation - Building a Data path - Control Implementation Scheme - Pipelining -Pipelined data path and control - Handling Data Hazards & Control Hazards - Exceptions.

#### **UNIT IV** PARALLELISIM

Parallel processing challenges - Flynn's classification- Vector Architectures - Hardware multithreading - Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

# **UNIT V MEMORY & I/O SYSTEMS**

Memory Hierarchy - memory technologies - cache memory - measuring and improving cache performance - virtual memory, TLB's - Accessing I/O Devices - Interrupts - Direct Memory Access -Bus structure - Bus operation - Arbitration - Interface circuits - USB.

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#### Total: 45 Periods

#### Text Books

- 1. David A. Patterson, John L. Hennessy and Morgan Kaufmann," Computer Organization and Design: The Hardware/Software Interface", Elsevier, 5<sup>th</sup> Edition 2017.
- 2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Tata McGraw Hill, 6<sup>th</sup> Edition 2017.

#### **Reference Books**

- 1. John Hennessey. L, David A. Patterson and Morgan Kaufmann, "Computer Architecture A Quantitative Approach", Elsevier Publishers, 5<sup>th</sup> Edition 2018.
- 2. John Hayes. P, "Computer Architecture and Organization", Tata McGraw Hill, 3<sup>rd</sup> Edition 2017.
- 3. William Stallings, "Computer Organization and Architecture Designing for Performance", Pearson Education, 10<sup>th</sup> Edition 2016.

#### Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc20\_cs64/preview
- 2. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-cs35/
- 3. https://nptel.ac.in/courses/106/103/106103180/

Mapping of Co	urse Outcomes	(COs) with Progra	mme Outcomes (P	Os) Programme Specific
<b>Outcomes (PS</b>	Os)			

<b>CO</b> -						POs								PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	1										3	1		
CO2	3	2	2	1									3	1		
CO3	3	2	1	1									3	1		
CO4	3	3	2	1									3	1	-	
CO5	3	3	2	2									3	1		
	3	Higl	h			2	Mec	lium				1	Low			

#### Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	15	
	Attendance	5	

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STIMO	
Summative	Assessment

Bloom's Category	Con	Final		
Remember	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination
	10	10	10	(60)
	30	30	30	10
Арріу	10	10		50
Evaluate	0	10	10	40
Create	0	0	0	0
<u>াগানে, কাইক</u>	0	0	0	- 0

20EC306	DIGITAL LOGICS AND MICROPROCESSOR		L	T	Ρ	С
Nature of Course	Engineering Science		3	0	2	4
Pre requisites	Digital Electronics	-				

# Course objectives:

The course is intended to

- 1. Learn Digital fundamentals, Boolean theorems and Minimization of logical functions for logic circuit implementation.
- 2. Acquire the Knowledge of Combinational Logic Circuits using Logic Gates
- 3. Expose Synchronous and Asynchronous Sequential Circuits
- 4. Study the 8086 Microprocessor Architecture and its Configuration with Timing Diagram 5. Know Assembly Language Programming and Interfacing of 8086 Microprocessor for different applications.

# Course Outcomes:

On successful completion of the course, students will be able to

001	Course Outcome	Bloom's Leve
COT	Apply the Minimization Techniques for Logical functions to Realize The logical Circuits.	Apply
CO2	Construct the combinational digital circuits using logic actas	
CO3	Develop the Synchronous and Asynchronous O	Apply
CO4	Explain the basic sensest of 0000	Apply
001	Configuration	Understand
CO5	Analyze the assembly language programme and interfacing of 8086 microprocessor with various applications	Analyze

# **Course Contents:**

# UNIT I Number System and Digital Logic Gates

Number Systems - Decimal, Binary, Octal, Hexadecimal, radix conversion, 1's and 2's complements, Codes - Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems & Postulates, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh Map Minimization (up to 4 variables).

# UNIT II Combinational Logic Circuits

Constructions of adder, Subtractor, Carry look ahead Adder, BCD Adder, Multiplier, Magnitude Comparator- Encoder, Decoder, Multiplexer and Demultiplexer - Parity Checker & Generator Realization of combinational circuits using decoders and multiplexers.

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# UNIT III Sequential Logic Circuits

**Synchronous :** Latches, Flip flops - SR, JK, T, D, Master/Slave FF - operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Shift Registers – Counters (Fundamental and Types).

**Asynchronous** (Quantitative Analysis only): Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments.

# UNIT IV The 8086 Microprocessor

Evolution of Microprocessor - Features, Pin Diagram & Architecture of 8086 Microprocessor - Memory segmentation - Physical address generation, Minimum mode and Maximum mode Configurations.

### UNIT V Assembly Language Programming and Interfacing Applications

Addressing modes and Instruction set of 8086 – Assembly language programming using 8086 – Keyboard and Display Controller - Interfacing of Keyboard and display using 8086 -Parallel Communication Interface - Traffic Light Interfacing using PPI.

#### **Total :45 Periods**

#### Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Study and Verification of Boolean theorems using digital logic Gates	CO1	Apply
2	Design and implementation of Binary to Gray and Gray to Binary code converters	CO1	Apply
3	Design and implementation of Half adder / Half subtractor, Full adder / Full subtractor using basic gates	CO2	Apply
4	Design and implementation of Encoder, Decoder, Multiplexer and Demultiplexer	CO2	Apply
5	Design and implementation of Shift registers	CO3	Apply
6	Basic arithmetic and Logical operations using 8086 Microprocessor	CO4	Apply
7	Code conversion, decimal arithmetic and Matrix operations using 8086 Microprocessor	CO4	Apply
8.	Floating point operations, string manipulations, sorting and searching using 8086 Microprocessor	CO4	Apply
9	Key board and Display interfacing using 8086 Microprocessor	CO5	Apply
10	Traffic light controller using 8086 Microprocessor	CO5	Apply
		Total: 30 P	eriods

#### **Text Books:**

- 1. Morris Mano.M and Michael D. Ciletti," Digital Design", Pearson, 6th Edition 2018.
- 2. Doughlas V. Hall, "Microprocessors and Interfacing Programming and Hardwarell", TMH, 3rd Edition 2017.

#### **References:**

- 1. Soumitra Kumar Mandal," Digital Electronics", McGraw Hill Education Private Limited,3<sup>rd</sup> Edition 2016.
- 2. Charles H. Roth, "Fundamentals of Logic Design", Cengage Learning, 6th Edition, 2015.
- 3. Thomas L. Floyd," Digital Fundamentals", Pearson Education, 10th Edition 2013.

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# Additional References:

1. https://nptel.ac.in/courses/117/105/117105080/

2. https://nptel.ac.in/courses/108/105/108105113/

3. https://onlinecourses.nptel.ac.in/noc20\_ee70/preview

-									(	Outco	nes (P	SOs)	-		
Cos							Pos	9						PSO	5
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3	3	1			1		-			4	2	2	4	-
CO2	3	2	2		2						-	2	0		
CO3	3	3	2		2	-					2	2	3	1	
003	0		2		2						2	2	3	1	
CU4	3	2	10.0								1	2	3	1	-
CO5	3	2	2		2						3	2	3	1	
	3	1.7	Hig	gh		2	<u>}</u>	1	Vediur	L n	3	1	3	Low	4

		Sun	nmative Asso	essment			
		Th	Practical's				
Bloom's Level	IAE – I (7.5)	IAE – II (7.5)	IAE III (10)	Attendance (5)	Rubric based CIA (20)	Final Examinatior (Theory) (50)	
Remember	10	10	10			30	
Understand	15	15	15			30	
Apply	25	25	15		50	25	
Analyze			10			15	
Evaluate						10	
Create							

20CS304 OPERATING SYSTEMS		L	T	Ρ	C
	(Common to CSE, 11 and AI & DS)	3	0	2	4
Nature of Cour	e Professional core	1 20			
Pre requisites	Programming with Data Structures		-	-	

#### **Course Objectives**

The course is intended to

- 1. Be familiar on the role, core structure, functions and services of operating systems.
- 2. Identify the components and appropriate management of computer hardware required for a process to execute correctly and compare the various Algorithms used for CPU Scheduling.
- 3. Provide solutions for issues that arise in process synchronization and distributed programming situations which lead to deadlock
- 4. Recognize the memory management and I/O management required to support concurrent processing and multi-threaded environments.
- 5. Make case studies about all the concepts of Operating system in Linux and VMware.

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#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Comprehend the structures, functions and services of operating systems.	Understand
CO2	Compare various Algorithms used for process and CPU Scheduling to solve problems.	Apply
CO3	Discover the issues that arise in process synchronization which lead to deadlock	Apply
CO4	Interpret the storage management policies with respect to different storage management technologies	Apply
CO5	Perform administrative tasks on Linux Servers	Analyze

#### Course Contents

## UNIT I OPERATING SYSTEMS OVERVIEW

Overview and Functions of operating systems, operating Systems structures, services, system programs, system calls and their working. History and Evolution of operating system- Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time.

# UNIT II PROCESS MANAGEMENT

Process and Threads - Process concepts, scheduling-criteria, Process Scheduling, Basic Concepts of Concurrency, Cooperating process, Basic Concepts of Inter-process Communication. Thread concept, issues and types, Multi-threading models. CPU Scheduling algorithms.

## UNIT III CONCURRENCY CONTROL

Concurrency: Principles of Concurrency, Mutual Exclusion: Critical section problem, Semaphores, pipes, Message Passing, Monitors, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Deadlock recovery.

# UNIT IV MEMORY MANAGEMENT AND MASS STORAGE STRUCTURE

Memory Management: contiguous memory allocation, Swapping, paging, segmentation, virtual memory, demand paging, page- replacement algorithms. File concept - Access Methods, Allocation methods - protection and sharing, Directory Structure, Free-space management. Disk structure, disk scheduling.

#### UNIT V CASE STUDY

Linux System- Basic Concepts; System Administration - Requirements for System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization. VMware: Infrastructure, Physical Topology, Virtual datacenter architecture, network and storage architecture, virtual center server.

TOTAL: 45 PERIODS

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# Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Hallus on Activity for OS Installation.	1	Understand
2	Demonstration of fork, exec and wait system calls along with zomble and orphan states.	1	Understand
3	Implementing a CPU scheduling policy with FCFS,SJF, Priority and RR algorithms	2	Apply
4	Thread synchronization using counting semaphores and mutual exclusion using mutex. Application to demonstrate: producer-consumer problem with counting semaphores and mutex.	3	Apply
5	Implement Deadlock Avoidance Using Semaphores	3	Apply
6	Develop a C program to simulate Page replacement using FIFO, LRU and Optimal algorithms.	4	Analyze
7	Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed c) Linked	4	Analyze
8	Implement a new system call, add this new system call in the Linux kernel (any kernel source, any architecture and any Linux kernel distribution) and demonstrate the use of same.	5	Analyze

# **Text Books**

# TOTAL: 30 Periods

- Abraham Silber Schatz, Greg Gagne and Peter B Galvin," Operating System Concepts", 1. Hoboken, NJ: Wiley Publisher, 10th Edition 2018.
- William Stallings," Operating Systems", Pearson Education India, 9th Edition 2018. 2.

# **Reference Books**

- 1. Gary Nutt, "Operating Systems", Pearson Education, 3rd Edition 2019.
  - 2. Andrew S. Tanenbaum," Modern Operating Systems", Pearson Education, 4<sup>th</sup> Edition 2018.
  - 3. Ramaz Elmasri, "A. Gil Carrick, David Levine, Operating Systems A Spiral Approach", Tata McGraw Hill, 3rd Edition 2015.

# Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105214/
- 2. https://nptel.ac.in/courses/106/106/106106144/
- 3. https://onlinecourses.nptel.ac.in/noc21\_cs44/preview

COs		POs										PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1								. A.		3	1	
CO2	3	2	2	1									3		-
CO3	3	2	2	1					-				3		
CO4	3	2	2	1									2		
CO5	3	3	2	1	1						2	2	3		_
1	3		H	igh	L	2		M	ediur	n	_	1	3	1	

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			Summativ	ve Assessment		
			Continuou	s Assessment	-	
Bloom's Level			Theory		Practicals	Final Examination
	IAE I (7.5)	IAE – II (7.5)	IAE – III (10)	Attendance (5)	Rubric based CIA (20)	(Theory) (50)
Remember	10	10	10			10
Understand	20	20	20		10	20
Apply	20	20	20		20	50
Analyze					20	20
Evaluate						
Create						

Nature of Course Profes	(Common to CSE, IT and AI & DS)			-	<b>_</b>
Nature of Course Profes		0	0	4	2
	sional Core		-	-	-
Pre requisites Progra	amming in C	-	-		

# **Course Objectives**

The course is intended to

- 1. Make familiar with java programming Language
- 2. Write simple programs using java applets
- 3. Develop applications in java using I/O streams and Exception handling mechanism
- 4. Implement generic programming for real time applications
- 5. Apply AWT and Java Swing to create GUI based applications

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Write simple java programs using basic language constructs	Understand
CO2	Execute programs using inheritance and interfaces	Apply
CO3	Solve complex problems using Exception Handling	Apply
CO4	Extend the concepts of multithreading and generic programming to solve real world problems	Apply
CO5	Integrate the concept of event driven programming to develop GUI based applications	Analyze

# Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Create java applications using java classes and methods	CO1	Apply
2	Write java applications using constructors	CO1	Apply
3	Design java applications to implement different types of inheritance.	CO2	Analyze

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4	Develop a simple program to get and display data using command line arguments.	000	1
5	Implement the concept of exception handling to solve complex problems.	CO2	Apply
6	Write programs to read and display the contents of a file using I/O streams	CO3	Analyze
7	Creation of real time applications using multithreading	CO3	Apply
8	Develop a java application using generic programming	CO4	Apply
9	Write programs in Java to create three-tier applications		Analyze
10	Create a GUI based java applet using appropriate controls from abstract window toolkit	005	Analyze
11	Develop a java GUI applet using Swings		Apply
		CO5	Apply

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Cas							P	os				_	1	DCO.	
Los	1	2	3	4	5	6	7	8	0	10	44	10		PSUS	-
1	3	1	1	1	2	-	1.	0	9	10	11	12	1	2	3
2	2	1	-		3		-			1	1	2	3	3	
4	5	1	1	1	3						1	2	3	3	
3	3	1	1	1	3						1	2	0	5	
4	3	2	1	2	3	1						2	3	2	
5	2	2		4	0	1					1	2	3	2	
		2		. I	3						1	2	3	2	_
	3	Hig	h			2	Med	dium				1	Low	2	

	Continuous Asses (Attendance	ssment (50 marks) e – 5 marks)	
Bloom's Level	Rubric based Continuous Assessment [25 marks]	Model Examination [20 marks]	Final Examination [50 marks]
Remember	1-0		
Understand	40	10	
Apply	60	40	40
Analyze	00	60	60
Evaluate			
Create	1		

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20140204	ENVIRONMENTAL SCIENCE	L	Т	Ρ	С
201010-301	(Common to CSE, IT, AI&DS, ECE and BME)	2	0	0	0
Nature of Course	Mandatory				
Prerequisites	Nil			_	

#### **Course Objectives**

The course is intended to

- 1. Understand the concept of eco system and environment.
- 2. Become conversant with ecological balance and values of bio diversity.
- 3. Know the role of human in prevention of pollution and making a clean environment.
- 4. Get knowledge about conservation of non conventional energy resources.
- 5. Study about the nature and management of e-waste and solid waste.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Describe the ecosystem and environment	Understand
CO2	Understand the ecological balance and preservation of bio diversity	Understand
CO3	Demonstrate various types of pollution in order to control pollution	Apply
CO4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO5	Identify the nature and management of e-waste and solid waste	Apply

### **Course Contents**

#### Unit-I Ecosystem

Eco system-Food chains, Food webs and Ecological pyramids. Ecosystem-(a) Forest eco system, (b) Aquatic eco system (pond ecosystem and marine ecosystem).

#### **Unit-II Biodiversity**

Introduction to Bio diversity, Values of Bio diversity, Threads to Biodiversity, Endangered and Endemic species of India, Hotspots of biodiversity. Conservation of Bio diversity: In-Situ and Ex-Situ conservation of bio diversity.

#### **Unit-III Environmental Pollution**

Definition, Causes, Effects and Control of (a) Air pollution (b) Water pollution (c) Soil pollution. Electrostatic Precipitator for controlling air pollution.

# Unit-IV Non-Conventional Energy Resources

Introduction, Types: Solar Energy, Wind Energy and Geo Thermal Energy.

#### **Unit-V Environmental Management**

Sustainable Development, Role of Information technology in Environment and Human.HIV and AIDS: causes and control measures. Green chemistry: Definition and Principles

#### Activity Component

S. No	Name of the Experiment	CO Mapping	RBT
1	Field study of simple eco system: pond, river and hill slopes	CO1	Understand
2	Case study regarding environmental management	CO5	Apply
<b>T</b> . ( <b>F</b>		Total: 30 pe	eriods

### **Text Books**

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2<sup>nd</sup> Edition, 2015.

2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition, 2010.

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# 6

# **Reference Books**

- 1. Santosh Kumar Garg and Rajeshwari Garg, "Ecological and Environmental Studies", Khanna Publishers, NaiSarak, Delhi, 2<sup>nd</sup> Edition, 2014.
- Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2<sup>nd</sup> Edition, 2012.

# **Additional Resources**

- 1. https://nptel.ac.in/courses/122103039/38
- 2. https://bch.cbd.int/cms/ui/collaboration/download/download.aspx?id=909
- 3. https://nptel.ac.in/courses/105102089/air%20pollution%20(Civil)/Module-3/3a.htm

						PC	Ds							PSOs	
Cos	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1						1	3			1		3			
CO2							3					3		-	
CO3							3				-	3			
CO4							3				-	3			
CO5					-		3					3			
003	3			l High		-	3	_	Mec	lium		3		Low	_

1/1					
Bloom's Level	IAE-I [20]	IAE-II [20]	IAE-III [20]	Attendance [10]	Activity [30]
Remember	30	20	20		[00]
Understand	10	20	20		
Apply	10	10	10		
Analyze					
Evaluate					
Create					

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#### SEMESTER IV

2014 0 4 0 3	Probability and Statistical Methods	L	LT			
201412405	(Common to CSE, 11 & Food Tech)	3 2 0				
Nature of Cours	e Basic Sciences					
Pre requisites	Fundamentals of Basic Mathematics					

#### **Course Objectives**

The course is intended to

- 1. Acquire the concepts of random variables essential for the subsequent and digital communication.
- 2. Introduce the basic concepts of random variables.
- 3. Acquaint with the knowledge of testing of hypothesis for small and large samples.
- 4. Familiarize with the basic concept on types of design of experiments used in the field of engineering
- 5. Study the concepts on types of classifications and statistical quality control.

#### **Course Outcomes**

On successful completion of the course, the students will be able to

00.11	Course Outcome	Bloom's Level
CO.No.		
CO1	Explain the concepts of a random variables and Probability distributions.	Understand
CO2	Examine the functions of multiples random variable.	Apply
CO3	Interpret the testing of hypothesis for small and large samples.	Understand
CO4	Apply the concepts of classifications of design of experiments in the field of engineering.	Apply
CO5	Illustrate the sampling distribution and statistical techniques	Understand

#### **Course Contents:**

#### **Unit | Probability and Random Variables**

Basics of Probability-Random Variables - Types of Random Variables: Discrete random variables - Continuous random variables- Probability functions, Moment Generating Functions -Discrete Distributions: Binomial and Poisson distributions-Continuous Distributions: Uniform and Exponential distributions.

# UNIT II Two - Dimensional random variables

Joint distributions – Marginal distributions- Covariance – Correlation and linear regression – Transformation of random variables - Central limit theorem (for independent and identically distributed random variables).

#### Unit III Testing of Hypothesis

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square for mean, variance and proportion - Contingency table (test for independent) -Goodness of fit.

#### Unit IV Design of experiments

One way and two-way classifications - Completely randomized design - Randomized block design - Latin square design -22 factorial design.

#### **Unit V Statistical Quality Control**

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits -Acceptance sampling.

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# Text Books:

# Total: 60 Periods

- 1. Oliver .C Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier Publisher
- 2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th

# **Reference Books:**

- 1. Robert V. Hogg Elliot Tanis Dale Zimmermann, "Probability and Statistical inference "Pearson
- 2. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications
- 3. Myers and R H and Walpole "Probability And Statistics and for Engineers and scientists", Pearson India, 9th Edition 2013.

# Additional References:

in.

1. https://nptel.ac.in/courses/111/102/111102111

2. https://nptel.ac.in/courses/110/107/110107114

C	Pos												PSOs			
Jos	1	2	3	4	5	6	7	8	9	10	11	12	1	2	2	
201	3	3	2	1	-	-	-							2	3	
202	3	2	2						-		-		2	-	14	
203	3	2	2			-			-	-	(+)	1	2	-		
204		0	2	-	-	-			-	-		1	2		1	
,04	3	2	1	-	-	-			-	-	ж.)	1	1			
205	3	2	2	-	2. A.	-	12	1				1			-	

Formative Assessment								
Bloom's Level	Assessment Component	Marks	Total marks					
Remember	Online Quiz	5	Total marks					
Jnderstand	Tutorial Class / Assignment	5						
	Attendance	5	15					
		S						

	Summ	native Assessme	ent	
Discusion O. 1	Internal A	Assessment Exa	minations	Final Examination
Bloom's Category	IAE – I (7.5)	IAE – II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	00
Understand	30	30	10	20
Apply	10	40	30	60
Analyze	10	10	10	20
Evaluate				
Create				

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20CS401	FORMAL LANGUAGES AND AUTOMATA THEORY	- L	Т	P	C
1000101	(Common to CSE, AI&DS)	3	0	0	3
Nature of Course	Professional Core				
Prerequisites	Nil				

# **Course Objectives**

The course is intended to

- 1. Perceive Automata theory and the language hierarchy
- 2. Learn the concept of automata for any given pattern
- 3. Enhance the knowledge on a context free grammar for any given language
- 4. Acquire knowledge on programming techniques of a Turing machines

5. Incorporate the concept of undecidable problems and NP class problems

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level				
CO1.	Design Automata for accepting or generating certain languages	Apply				
CO2,	Interpret automata and regular expression for any pattern	Apply				
CO3.	CO3. Formulate Context free grammar and pushdown automata					
CO4.	CO4. Analyze the use of Turing Machine and properties of context free grammar					
CO5,	CO5. Analyze the decidability and undecidability of various problem					

#### **Course Contents:**

# Unit - I Automata Fundamentals

Introduction to formal proof – Additional forms of Proof – Inductive Proofs -Finite Automata – Deterministic Finite Automata - Non-deterministic Finite Automata - Finite Automata with Epsilon Transitions

## Unit - II Regular Expressions and Languages

Regular Expressions - FA and Regular Expressions - Proving Languages not to be regular - Closure Properties of Regular Languages - Equivalence and Minimization of Automata - Applications of Regular Expressions.

# Unit - III Context Free Grammar and Languages

CFG - Parse Trees - Ambiguity in Grammars and Languages - Definition of the Pushdown Automata - Languages of a Pushdown Automata - Equivalence of Pushdown Automata and CFG.

# Unit – IV Properties of Context Free Languages

Normal Forms for CFG - Pumping Lemma for CFL - Closure Properties of CFL - Turing Machines - Programming Techniques for TM.

# Unit - V Undecidability

9 Non-Recursive Enumerable (RE) Language - Undecidable Problem with RE - Undecidable Problems about TM - Post's Correspondence Problem, The Class P and NP.

#### Text Books:

- Total :45 Periods
- Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning, 3rd Edition 2018.
- Hopcroft J.E, Motwani and Ullman.D, "Introduction to Automata Theory, Languages and Computations", Pearson Education, 3<sup>rd</sup> Edition 2017.

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# **Reference Books:**

- 1. Martin.J, "Introduction to Languages and the Theory of Computation", Tata Mc Graw Hill, New Delhi, 3rd Edition 2020.
- 2. Kamala Krithivasan and Rama.R, "Introduction to Formal Languages Automata Theory and Computation", Pearson Education, 3rd Edition 2018. 3. Lewis H.R and Papadimitriou C.H, "Elements of the theory of Computation", Prentice-Hall of
- India Pvt. Ltd, 2nd Edition 2015.

# Additional References:

- 1. https://nptel.ac.in/courses/111/103/111103016/
- 2. https://nptel.ac.in/courses/106/106/106106049/
- 3. https://www.digimat.in/nptel/courses/video/111103016/L01.html

Марр	oing of	Cour	se Ou	tcome	es (CC	Ds) wit Ou	tcome	gramn s (PS	ne Out Os)	comes	(POs)	Progra	amme	Speci	fic
Cos							Pos							PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3										3	3	2
CO2	3	3	3						-				3	3	2
CO3	3	3	3										3	2	2
CO4	3	3	3		1								2	3	2
CO5	3	3	2										3	3	2
	0	5	3	_									3	3	2
	3		Hig	jh		2			Mediu	m		1	4	Low	

a Constant	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz	5	IIIai KS
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	- 15

V.	Si	immative Asse	ssment	
Bloom's Category	Internal A	ssessment Exa	Terminal Examination	
bioon s category	IAE – I (7.5)	IAE - II (7.5)	- II (7.5)   IAE - III (10)	
Remember	10	10	0	20
Understand	20	20	10	20
Apply	10	10	20	40
Analyze	10	10	20	20
Evaluate		100 C		20
Create				

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20CS402	SOFTWARE ENGINEERING	L	T	P	С
	(Common to CSE, IT)	3	0	0	2
Nature of Course	Professional Core		•	•	-
Pre requisites	NIL		-	-	-

#### **Course Objectives**

The course is intended to

- 1. Understand the phases in a software project
- 2. Perform feasibility study of the projects under the requirement engineering process and system models
- 3. Acquire the knowledge about Agile Software development model
- 4. Learn various testing Strategies.
- 5. Have knowledge about the Metrics for Process, Projects and Quality Management

# **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Recognize the software development lifecycles, phases, activities and the artifacts created in each phase of a lifecycle	Understand
CO2.	Identify software development needs and challenges that require various engineering solutions, and formulate such solutions	Understand
CO3.	Apply systematic procedure for Agile software design and deployment	Apply
CO4.	Propose testing strategy for a given software	Analyze
CO5.	Analyze project schedule and cost estimation.	Analyze

# **Course Contents**

UNIT IINTRODUCTION TO SOFTWARE ENGINEERING AND PROCESS MODELS9Professional Software Development - Layered Technology - Process framework, CMM, ProcessPatterns and Assessment. Process Models - Prescriptive Models: Waterfall Model, Incremental, RADModels Evolutionary Process Models: Prototyping, Spiral and Concurrent Development ModelSpecialized Models: Component based, Aspect Oriented development

# UNIT II REQUIREMENTS ANALYSIS AND DESIGN ENGINEERING

Requirements Engineering Tasks, Elicitation, building analysis model, Data Modeling concepts, Object Oriented Analysis. Design Concepts, Design Model - Data, Architecture, Interface, Component Level and Deployment Level design elements

# UNIT III AGILE SOFTWARE DEVELOPMENT AND MODELING PRACTICES

Agile Process and Process Models, Adaptive and Dynamic system Development, Scrum, Feature Driven Development and Agile Modeling - Core Principles, Communication, Planning, Modeling, Construction and deployment. System Modeling and UML

# UNIT IV TESTING STRATEGIES

9 Overview of Testing- Testing Concepts-Faults, Erroneous States, Failures-Test Cases- Test Stubs and Drivers- Corrections-Testing Activities- Component Inspection – Usability Testing-Unit Testing-Integration Testing-System Testing-Managing Testing-Planning Testing-Documenting Testing-Assigning Responsibilities-Regression Testing- Automating testing

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UNIT V METRICS FOR PROCESS AND PROJECTS AND QUALITY MANAGEMENT 9 Process Metrics and Project Metrics, Software Measurement, Object Oriented Metrics, Software Project Estimation-COCOMO, Decomposition Techniques, LOC based, FP based and Use case based estimations, Empirical estimation Models. Quality Management - Quality Concepts, SQA activities, Software reviews, FTR, Software reliability and measures, SQA plan.

### Total: 45 Periods

# Text Books

- 1. Lan Sommerville, "Software Engineering", Pearson Education Asia, 10th Edition 2019.
- Roger S. Pressman, "Software Engineering A Practitioner's Approach", Mc Graw-Hill, 2<sup>nd</sup> Edition, 2017.

# **Reference Books**

- 1. Pankaj Jalote, "Software Engineering", A Precise Approach-Wiley India, 10th Edition 2020.
- 2. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 3rd Edition 2018.
- 3. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Private Limited, 3<sup>rd</sup> Edition 2015.

#### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105182/
- 2. https://onlinecourses.nptel.ac.in/noc20\_cs68/preview
- 3. https://nptel.ac.in/courses/106/101/106101061/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

00-		POs											PSOs		
CUS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1					1				3	1	
CO2	3	2	2	1	2						2	2	0		
CO3	3	2	1	1	-		-					2	3		
004	0	4				1			_				3	1	
CO4	3	3	2	1	2	1		1			1	2	3	1	
CO5	3	3	2	2	2	1	17	1		. N.	3	2	3	1	
	3	High	1			2	Mec	lium			-	1	Low		

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz		
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

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	Summat	tive Assessmen	t	
Bloom's Category	Internal Ass	essment Exami	nations	Final
	IAE – I (7.5)	IAE II (7.5)	IAE III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	10	30
Apply	20	20	20	40
Analyze	0	0	10	20
Evaluate	0	0	0	0
Create	0	0	0	0

2005403	DATA COMMUNICATION AND COMPUTER NETWORKS	L	Т	Ρ	С
2000400	(Common to CSE, IT)	3	0	0	3
Nature of Course	Engineering Sciences		-		I
Pre requisites	Computer Architecture				

#### **Course Objectives**

The course is intended to

- 1. Understand the protocol layering and physical level communication.
- 2. Examine the performance of a Data link control.
- 3. Learn the functions of network layer and the various routing protocols.
- 4. Recognize the components required to build different networks.
- 5. Familiarize with the functions and protocols of the application layer.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1,	Classify the basic layers and its functions in computer networks.	Understand
CO2.	Interpret the protocols of data link layer can be used to assist in network design and implementation.	Apply
CO3.	Analyze the topological and routing strategies for an IP based networking infrastructure	Analyze
CO4.	Apply reliable and unreliable transfer of data in TCP and UDP.	Apply
CO5.	Recognize the working of various application layer protocols.	Understand

#### **Course Contents**

# UNIT I INTRODUCTION AND PHYSICAL LAYER

The internet-Protocol and standards, Network model - OSI model – Layers -TCP/IP protocol suite - Addressing, Analog and Digital signals- Transmission impairment - Data rate limits - performance, Multiplexing, Spread spectrum, Transmission media, Switching.

# UNIT II DATA-LINK LAYER & MEDIA ACCESS

Error detection and correction – Introduction – Block coding – CRC – Checksum, DLC – Framing – Flow and Error control – Protocols : Noiseless and noisy channels – HDLC – PPP, Multiple access – Random and controlled access, Wired LANs: Ethernet, Wireless LANs: IEEE 802.11 – Bluetooth, Connecting devices.

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#### UNIT III NETWORK LAYER

Logical addressing, Internet protocol: Internetworking - IPV4 and IPV6, Address mapping - ICMP -IGMP. Delivery - Forwarding - Unicast and Multicast routing protocols,

#### UNIT IV TRANSPORT LAYER

Process to process delivery: UDP - TCP - SCTP, Adaptive Flow Control - Adaptive Retransmission -Congestion control -Congestion avoidance - examples - QoS- Techniques to improve QoS. APPLICATION LAYER

Email (SMTP, MIME, IMAP, POP3) - WWW - HTTP - DNS - SNMP - Teinet - FTP - Security - PGP -

# **Text Books**

# Total: 45 Periods

- 1. William Stallings, "Data and Computer Communications", Pearson Education, 8th Edition, 2019.
- 2. Behrouz Forouzan.A, "Data Communications and Networking" TATA McGraw Hill Education,

# **Reference Books:**

- 1. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open-Source Approach", McGraw Hill Publisher, 2nd Edition 2018.
- 2. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kauffmann Publishers Inc., 5th Edition, 2016.
- 3. Ajit Pal," Data Communication and Computer Networks ", PHI Learning, 2<sup>nd</sup> Edition 2015.

# Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105082/
- 2. http://www.nptelvideos.in/2012/11/data-communication.html
- 3. https://nptel.ac.in/courses/106/105/106105183/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Cos		· · · ·					Pe	os						PSOs	
COS	1	2	3	4	5	6	7	8	9	10	11	12	4		1
CO1	3	3	2	2			-			10		14		2	3
CO2	3	2	3	1					-				3	1	
003	2	-	3	0		-						1	3	1	
000	3	2	- I - 1	2	1	-	1					1	3	1	
CO4	3	3	3	2					-	-		-	0		-
CO5	3	3	1	1	1	1 1				-	-	-	3	1	
		0	19:11		1	-	-					1	3	1	
_	3	High	1			2	Med	ium			_	1	Low		

	Formative assessment		
Bloom's Level	Assessment Component	Marko	Total marks
Remember	Online Quiz	Widt KS	
Understand	Tutorial Class / Assistant	5	
	rutonal Class / Assignment	5	15
	Attendance	5	

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Summative Assessment						
Bloom's Category	Interna	al Assessment I	Examinations	Final		
	IAE – I (7.5)	IAE – II (7.5)	IAE III (10)	Examination (60)		
Remember	10	10	10	10		
Understand	20	20	20	50		
Apply	20	20	20	30		
Analyze	0	0	0	10		
Evaluate	0	0	0	0		
Create	0	0	0	0		

2005404	DATABASE MANAGEMENT SYSTEMS	L	T	Ρ	С
2000404	(Common to CSE, IT and AI & DS)	3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Basics of Data Structures			-	

# **Course Objectives**

The course is intended to

- 1. Familiarize the fundamentals of data models and SQL
- 2. Represent a database system using ER diagrams and relational schema
- 3. Understand the fundamental concepts of transaction processing- concurrency control Techniques and recovery procedures
- 4. Identify with the internal storage structures using different file and indexing techniques which will help in physical database design.
- 5. Have a comparative knowledge about the various advanced databases.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Classify the modern and futuristic database applications and write queries using various SQL commands	Analyze
CO2.	Construct ER Model and Design relational schema for a given database application.	Apply
CO3.	Illustrate the concepts for transaction processing and concurrency control.	Understand
CO4.	Apply indexing and hashing techniques to access and generate user reports for a database.	Apply
CO5.	Appraise how advanced databases differ from traditional databases	Evaluate

# **Course Contents**

#### UNITI **RELATIONAL DATABASES**

9

Purpose of Database System - Views of data - Data Models - Database System Architecture -Introduction to relational databases - Relational Model - Keys - SQL fundamentals - Advanced SQL features, PL/SQL.

#### UNIT II DATABASE DESIGN

Entity-Relationship model: Diagrams - Enhanced Model -Relational Mapping - Relational Algebra -9 Functional Dependencies - Non-loss Decomposition - First, Second, Third Normal Forms, Boyce/Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form

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# UNIT III TRANSACTIONS

9 Transaction Concepts - ACID Properties - Schedules - Serializability - Concurrency Control - Need for Concurrency - Locking Protocols - Two Phase Locking - Deadlock - Transaction Recovery - Save Points - Isolation Levels - SQL Facilities for Concurrency and Recovery.

# UNIT IV IMPLEMENTATION TECHNIQUES

RAID - File Organization - Organization of Records - Indexing and Hashing -Ordered Indices - B tree and B+ tree Index Files - Static and Dynamic Hashing - Query Processing Overview - Algorithms for SELECT and JOIN operations - Query optimization using Heuristics and Cost Estimation.

# UNIT V ADVANCED DATABASES

Distributed Databases: Architecture, Storage, Transaction Processing - Object-based Databases: Concepts-Object-Relational features, MongoDB - Concepts and features, XML Databases: XML Hierarchical Model, DTD, XQuery - Information Retrieval: Retrieval Models, Queries in IR systems.

### Total: 45 Periods

# Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
	Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving		1
1	Tables and Transaction Control statements. Database Querying – Simple queries, Nested queries, Sub queries and Joins	1	Understand
2	Practicing PL/SQL for a real time application	1	Apply
3	Database Design using ER modeling, normalization and Implementation for any application	2	Apply
4	Write relational algebra queries for a given set of relations.	2	Apply
5	XML database creation and validation	5	Analyze
6	Case Study using real life database applications	5	Apply

#### Text Books

# Total : 30 Periods

- Abraham Silber Schatz, Henry Korth.F and Sudarshan. S, "Database System Concepts", Mc Graw Hill, 7th Edition 2019.
- Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems", Addison-Wesley, 5<sup>th</sup> Edition 2017.

#### References

- 1. Gupta G.K, "Database Management Systems", Tata McGraw Hill, 3rd Edition 2020.
- Raghu Ramakrishnan," Database Management Systems", McGraw-Hill College Publications, 4th Edition 2018.
- 3. Date C.J, Kannan. A, Swaminathan.S, "An Introduction to Database Systems", Pearson Education, 8th Edition 2017.

#### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105175/
- 2. https://onlinecourses.nptel.ac.in/noc21\_cs04/preview
- 3. https://nptel.ac.in/courses/106/106/106106093/

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Mapping o Dutcomes	f Cour (PSO:	rse O s)	utco	mes	(COs	s) wit	h Pro	ogran	nme	Outc	ome	s (PC	s) Progr	amme Spe	ecific
COs					-	PSOs									
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2					V					3	1	
CO2	3	2	2	1								1	3	1	
CO3	3	2	1	1								1	3	1	
CO4	3	3	2	1	2						2	1	3	1	
CO5	3	3	2	2	2	-	1	-			2	1	3	1	
	3	Hig	h		1	2	Med	dium				1	Low		

			Summative	e Assessment	8 m m	
			Continuous	Assessment		
	-		Practicals	Final		
Bloom's Level						Examination (Theory)
	IAE-I [7.5]	IAE-II [7.5]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	[50]
Remember	10	10	10			10
Understand	10	20	20		10	20
Apply	20	20	10		20	50
Analyze	10		10		20	10
Evaluate						10
Create						

Passed in Board of studies Meeting 30.06.2021



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20CS405					
	COMPUTER GRAPHICS AND MULTIMEDIA	L	Т	P	C
Nature of Course	Professional Core	3	0	2	4
Pre requisites	Mathematical and Logical Knowledge				

#### **Course Objectives**

The course is intended to

- 1. Study the process of illumination and color models
- 2. Incorporate the concept of two-dimensional graphics and their transformations.
- 3. Introduce the concept of three-dimensional graphics and their transformations.
- 4. Acquire the knowledge on clipping techniques 5. Plan with Blender Graphics

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. NO.	Course O I	
CO1	Develop algorithmic solutions to drawing all a the	Bloom's Level
CO2	Design two-dimensional graphics and transformation	Apply
CO3	Design three-dimensional graphics and transformations.	Apply
CO4	Propose the different types of Multimedia File Formet	Apply
CO5	Design Basic 3D Scenes using Blender	Apply
	set using biolitici.	Annly

#### Course Contents:

#### UNIT I Illumination and Color Models

Light sources - basic illumination models - halftone patterns and dithering techniques; Standard primaries and chromaticity diagram; Intuitive color concepts and color models; Color selection. Line drawing algorithms; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

#### UNIT II **Two-Dimensional Graphics**

Two dimensional geometric transformations - Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing - viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two-dimensional viewing functions; clipping

#### UNIT III Three-Dimensional Graphics

Three dimensional concepts; Three-dimensional object representations - Polygon, Curved lines and Quadratic surfaces; Blobby objects; Spline representations - Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations - Three-dimensional viewing.

#### Multimedia System Design & Multimedia File Handling UNIT IV

Multimedia basics - Multimedia applications - Multimedia system architecture - Evolving technologies for multimedia - Defining objects for multimedia systems - Multimedia data interface standards -Multimedia databases. Compression and decompression - Data and file format standards -Multimedia I/O technologies - Image, Audio, Video and Animation - Full motion video - Storage and retrieval technologies

#### UNIT V Hypermedia

Multimedia authoring and user interface - Hypermedia messaging - Mobile messaging - Hypermedia message component - Creating hypermedia message - Integrated multimedia message standards -Integrated document management - Distributed multimedia systems. CASE STUDY: Blender Graphics

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#### **TOTAL: 45 Periods**

S. No	List of Experiments	CO Mapping	RBT
-1	Implementation of Algorithms for drawing 2D Primitives - Line (DDA, Bresenham) - and Circle (Midpoint).	CO1	Apply
2	Implementation of 2DGeometric transformations: Translation, Rotation, Scaling, Reflection, Shear	CO2	Apply
3	Implementation of Composite 2D Transformations	CO2	Apply
4	Implementation of Liang - Barsky Line Clipping.	CO2	Apply
5	Implementation of 3D Transformations - Translation, Rotation, Scaling	CO3	Apply
6	Implementation of 3D Projections - Parallel, Perspective	CO3	Apply
7	Creating 3D Scenes.	CO3	Apply
8	Compression Algorithms - To implement text and image compression algorithms	CO4	Apply
9	Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.	CO5	Apply
10	2D Animation - To create Interactive animation using any authoring tool	CO5	Apply

#### Text Books:

- 1. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 3rd Edition 2019.
- Andleigh, P. K and Kiran Thakrar, "Multimedia Systems and Design", PHI Publishers ,2<sup>nd</sup> Edition 2017.

#### Reference Books:

- 1. Foley, Vandam, Feiner and Hughes, "Computer Graphics: Principles and Practice", Pearson Education ,2<sup>nd</sup> Edition 2020.
- Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 4th Edition 2018.
- Judith Jeffcoate, "Multimedia in practice: Technology and Applications", PHI Publishers, 2<sup>nd</sup> Edition 2017.

#### Additional References:

- 1. https://nptel.ac.in/courses/106/106/106106090/
- 2. https://nptel.ac.in/courses/106/103/106103224/
- 3. https://nptel.ac.in/courses/106/102/106102063/

Cos	_			PSOs											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
201	3	2	1				ice - ii						3	2	-
CO2	3	2	1		1								0	4	
203	3	2	2										3	2	
204	2	2	2		-								3	2	
205	0	2	2										3	2	
205	3	2	2										3	2	_
	3 High					2		N	lediur	n		1	Low	2	_

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	1		Summative Continuous	assessment		
Bloom's Level		Final				
	IAE – I (7.5)	IAE II (7.5)	IAE – III (10)	Attendance [5]	Rubric based CIA	Examination (Theory)
Remember	10	10	10		[20 Marks]	[ee marks]
Understand	20	20	20			20
Apply	20	20	20		30	50
Analuzo	20	20	20		50	30
Allalyze					20	
Evaluate						
Create						

20CS406	DATA COMMUNICATION AND COMPUTER	L		Ρ	С
	(Common to CSE, IT)	0	0	4	2
Nature of Course	Engineering Sciences				1
Pre requisites	Basic Network Concepts		-		

#### **Course Objectives**

The course is intended to

- 1. Learn and use network commands.
- 2. Develop the error correction codes.
- 3. Implement and analyze various network protocols.
- 4. Implement the TCP UDP
- 5. Use simulation tools to analyze the performance of application layer protocol.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's
CO1	Practicing various network commands.	Apply
CO2	Implement error correction codes.	Apply
CO3	Use simulation tools to analyze the performance of various network protocols.	Analyze
CO4	Compare the performance of different transport layer protocols	Apply
CO5	Analyze Application Layer Protocols	Analyze

#### Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.	CO1	Apply
2	Write a code for error correction and detection (like CRC).	CO2	Apply
3	Implement Flow control mechanisms in Data link control	CO2	Apply
4	Write a code simulating ARP /RARP protocols.	CO2	Analyza
5	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.	CO3	Apply
6	Simulation of Distance Vector/ Link State Routing algorithm.	CO3	Analyze

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7	Write a HTTP web client program to download a web page using TCP sockets.	CO4	Apply
8	Applications using TCP sockets like: a)Echo client and echo server b) Chat c) File Transfer	CO4	Analyze
9	Study of TCP/UDP performance using Simulation tool.	CO4	Apply
10	Simulation of DNS using UDP sockets.	CO5	Apply

#### **TOTAL: 60 Periods**

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

						PSOs									
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	3	2									2	3	
2	2	3	3	2									2	3	
3	2	3	3	2									2	3	
4	2	3	3	2									2	3	
5	2	3	3	3			1	-		F		_	2	3	
	3	Hig	h			2	Medium 1				Low	Low			

Bloom's Level	Rubric based Continuous Assessment [50 marks]	End Semester Examination [50 marks]
Remember		
Understand	10	20
Apply	20	40
Analyze	20	40
Evaluate		
Create		and the second

20MC401 Nature of Co Prerequisite	Comm	SOFT SKILL	L	Т	Ρ	С
Nature of C	Course	Mandaton ( Onurse	2	0	0	0
Prerequisit	es	Nil			_	

#### **Course Objectives**

The course is intended to

- 1. Improve language skills in personal and professional life
- 2. Equip students with the vital communication and soft skills to succeed in the highly competitive international professional arena
- 3. Focus on the fundamental soft skills and of their practical social and work place usage
- 4. Make the students to identify and overcome the barriers in interpersonal relationships
- 5. Enhance employability skills and ensure career success

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### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Relate the significance and fundamental nature of soft skills	Remember
CO2	Take part in a wide range of public speaking and professional group discussions	Understand
CO3	Plan one's time effectively and productively, especially at work	Apply
CO4	Make use of leadership skills to manage stress & conflict	Apply
CO5	Organize presentations effectively and participate in interview with confidence.	Apply

#### **Course Contents**

## Unit - I Introduction to Soft Skills and Interpersonal Communication 6 Introduction – Definition and Significance of Soft Skills; Interpersonal communication-types of interpersonal communication.

### Unit - II Public Speaking and Oral Communication skills

Public Speaking: Skills, Methods and Strategies -Group Discussion - Importance, Planning and Elements.

## Unit – III Time Management and Personality Development

Time Management - Concepts and essentials tips. Personality-development - meaning, SWOT analysis & goal setting- Stress and conflict management.

### Unit – IV Leadership skills and Emotional Intelligence

Leadership skills - Concept of Leadership and honing Leadership Skills - Problem-solving Skills - Group influence and Ethical Decision-Making. Emotional Intelligence - Strategies to enhance Emotional Intelligence.

#### Unit-V Interview Skills

Interviewer - Interviewee perspectives - Self Introduction and Presentation: Types, Content and Essential Tips-before, during and after a presentation, Overcoming Nervousness - Mock Interview.

#### **Total: 30 Periods**

6

#### Text Books

- 1. Ghosh B.N," Managing Soft Skills for Personality Development", McGraw Hill India, 2<sup>nd</sup> Edition 2018.
- 2. Dhanavel S.P, "English and Soft Skills", Orient Black swan India Publishers, 3rd Edition 2017.

#### **Reference Books:**

- 1. Sutapa Banerjee," Soft Skill Business and Professional Communication" IK International Publisher, 1<sup>st</sup> Edition 2020.
- Pushp Lata and Sanjay Kumar, Communication Skills, Oxford University Press ,2<sup>nd</sup> Edition 2019.
- 3. Kul Bhushan Kumar," Effective Communication Skills", Khanna Publisher, 1st Edition 2018.

#### Additional Reference:

1. https://nptel.ac.in/courses/109/107/109107121/

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Mapping o	of Cours	se Oi	utcome	es (C	0) wi O	th Pro utcon	ogran nes (l	nme ( PSO)	Dutco	mes	(PO) F	Progra	mme \$	Specif	fic
0		Pos										PSOs			
Cos	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1								1	2	3		2			
CO2					-			1	2	3	-	2			
CO3							-	1	2	3		2	-		-
CO4							-	1	2	3		2			
CO5							1.1	1	2	3		2			-
	3		High			2	N	lediu	m	100	1	Lo	w		

https://onlinecourses.nptel.ac.in/noc21\_hs76/preview
 https://nptel.ac.in/courses/109/107/109107121/

Bloom's Loval	Summative Assessment (Internal Mode)									
Dioonii S Level	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)								
Remember	10	10								
Understand	- 10	10								
Apply	30	30								
Analyze										
Evaluate										
Create										

Passed in Board of studies Meeting 30.06.2021



Approved in Academic Council Meeting 04.10.2021

SEM	EST	ER	V
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20CS501	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	L	Т	P	C
Nature of Course	Professional Core	3	0	0	3
Prerequisites	NIL				

### **Course Objectives**

The course is intended to

- 1. Familiarize the fundaments of intelligent agents.
- 2. Acquire knowledge on problem solving techniques.
- 3. Analyze the problem and make decisions by interring new knowledge using knowledge
- 4. Develop planning and acting in real world problem.
- 5. Gain knowledge in learning algorithms.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. NO.	Course Outcome	Bloom's Level
CO1	Summarize the basics of AI and Intelligent agent	Linderstand
CO2	Apply and illustrate how search algorithms play vital role in problem	Understand
_	solving	Apply
CO3	Construct knowledge representation and knowledge of reasoning for solving real world problems	Apply
CO4	Classify the different ways of planning and acting in the real world	Apply
CO5	Apply suitable learning methodology while designing systems based on	Apply
	their applications	Apply

#### **Course Contents:**

#### UNIT-I INTRODUCTION TO AL

Introduction to AI - The Foundations of AI - The History of AI - The State of the art - Agents and Environments - Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of agents.

#### UNIT - II SOLVING PROBLEMS BY SEARCHING TECHNIQUES

Problem-Solving Agents - Example Problems: Toy problems - Searching for solution - Uninformed search strategies - Informed search and Exploration: Heuristic Functions - Constraint Satisfaction Problems: Backtracking search.

#### UNIT - III KNOWLEDGE AND REASONING

Logical Agents: Knowledge based agents - The Wumpus World - Logic - Propositional Logic - First order Logic: Syntax and Semantics of First-order Logic, Introduction to PROLOG.

#### **UNIT - IV** PLANNING AND ACTING

The Planning Problem - Planning with State-Space Search - Partial- Order Planning - Planning and acting in the real world: Time, Schedules and Resources - Hierarchical Task Network Planning -Conditional Planning - Continuous Planning - Multi Agent Planning.

#### UNIT - VUNCERTAIN KNOWLEDGE AND REASONING

Uncertainty: Acting under uncertainty - Basic Probability Notation - The Axioms of Probability - Making Simple decisions: Utility Functions - Decision Networks - Learning systems-supervised learning, unsupervised learning.

Passed in Board of studies Meeting 25.02.2022

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#### Total: 45 Periods

#### Text Books:

- 1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, 4<sup>th</sup> Edition, 2020.
- 2. I. Bratko, "Prolog Programming for Artificial Intelligence", Addison Wesley Educational Publishers Inc, 4<sup>th</sup> Edition 2011.

#### **Reference Books:**

- 1. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Springer Science & Business Media, 5th Edition 2012.
- 2. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Learning, 2009.
- 3. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.

#### Additional / Web References:

- 1. https://nptel.ac.in/courses/106/102/106102220/
- 2. https://nptel.ac.in/courses/106/105/106105078/
- 3. https://nptel.ac.in/courses/106/106/106106126/

Mapping	of Coui	rse Ou	utcom	nes (C	:0) w	vith F Dutc	Progr omes	amm s (PSC	e Out O)	come	es (PC	)) Pro	gramm	e Spec	ific
				Pos	5									PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2		2							2	2	1	1
CO2	3	2	2		2			_				2	3	3	3
CO3	3	2	2		2							1	2	2	
CO4	3	3	3		2							1	3	3	3
CO5	3	3	3		2							2	3	3	3
	3	High	1			2	Med	lium				1	Low		

Formative assessm	ient		
Bloom's Level	Bloom's Level Assessment Component		
Apply	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
	Attendance	5	

	Su	Immative Asse	ssment	
	Continu	ious Assessme	ent Tests	Touris LE 1 4
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	(60)
Remember	15	15	10	20
Understand	20	15	20	20
Apply	15	20	20	30
Analyse				
Evaluate				20
Create			1	

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022

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20CS502	COMPILER DESIGN	L	Т	Ρ	С
Nature of Course		3	0	0	3
Nature of Course	Professional Core			-	-
Pre requisites	Operating System, Theory of Computation				

#### **Course Objectives**

The course is intended to

- 1. Be aware of phase of compiler and fundamentals of lexical analysis
- 2. Discuss syntactic analysis functionalities of compiler
- 3. Generate intermediate code for programming constructs
- 4. Identify and use suitable storage allocation technique to generate the target code
- 5. Familiar with the Code Optimization Techniques

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Apply regular expression to perform lexical analysis of the source program	Apply
CO2	Design a syntax-analysis tool for the given grammar	Apply
CO3	Develop intermediate code for the source program	Apply
CO4	Use suitable storage allocation technique to generate the target code	Apply
CO5	Make use of optimization techniques for the given intermediate code	Apply

#### **Course Contents:**

### UNIT - I INTRODUCTION AND LEXICAL ANALYSIS

Introduction – Language Processors – The Phases of a compiler – Lexical Analysis : The Role of the Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – The Lexical-Analyzer Generator – Lex – Finite Automata – From Regular Expressions to Automata.

#### **UNIT-II SYNTAX ANALYSIS**

The role of the parser-Context-free grammars-Writing a grammar-Top down parsing- Operator Precedence Parser-Bottom-up Parsing- Shift Reduce Parser-LR parsers: SLR parser – Canonical LR parser –LALR Parser.

### UNIT-III SYNTAX - DIRECTED TRANSLATION AND INTERMEDIATE CODE GENERATION

Syntax-Directed Translation – Evaluation orders for SDDs – Intermediate Code Generation – Variants of syntax trees – Three Address Code – Types and Declarations – Translation of Expressions – Control Flow – Backpatching – Switch Statements – Procedure calls.

### UNIT- IV CODE GENERATION AND STORAGE MANAGEMENT

Issues in the design of a code generation – The target Language – Addresses in the Target code – A simple code Generator – Run-Time Environments: Storage organization – Stack allocation of space – Access to Non-Local Data on the Stack – Introduction to garbage collection.

#### UNIT -V CODE OPTIMIZATION

Optimization of Basic Blocks- Peephole Optimization – The Principal Sources of Optimization – DAG-Introduction to Data-Flow Analysis – loops and flow graphs.

Total: 45 Periods

Passed in Board of studies Meeting 25.02.2022



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9

9

#### Text Books:

- 1. Aho Alfred, Sethi Ravi and Ullman Jeffrey D., "Compilers: Principles, Techniques and Tools", 2nd Edition, Pearson India Education Pvt. Ltd., 2014.
- 2. Santanu Chattopadhyay "Compiler Design ", PHI learning, 6th edition 2011.

#### **Reference Books:**

- 3. V Raghavan , "Principles Of Compiler Design", Tata Mcgraw Hill Publishing Co Ltd, 2016.
- 4. Srikant Y.N. and Priti Shankar, "The Compiler Design Handbook: Optimizations and Machine Code Generation", CRC Press, 2nd Edition 2008.
- 5. David Galles, "Modern Compiler Design", Pearson Education Asia, 2007.

#### **Additional References:**

- 1. Nptel course, Compiler Design, https://onlinecourses.nptel.ac.in/noc19\_cs01/preview
- 2. E-Book link: http://index-of.es/Varios-2/Compilers.pdf
- 3. Nptel course, Compiler Design : https://nptel.ac.in/courses/106/105/106105190/

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

COs						Р	os				1 V.			PSOs	;
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	1.65		-	4	+	21		14	-	-	3	
CO2	3	3	2	÷	-	-	)e:	-	×	-		-	1.1	3	
CO3	3	3	2			=		37			-0	-		3	Ħ
CO4	3	3	2		-	-	1.4	-	-	1	40	2	-	3	-
CO5	3	3	2	0.7		-		-		-	-	-	-	3	-
	3		High			2	2 Medium				1		Low		

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

Summative Assessment									
Bloom's Category	Intern	al Assessment E	xaminations	Final Examination					
Bloom's Category	IAE – I (7.5)	IAE – II (7.5)	IAE - III (10)	(60)					
Remember	10	10	10	20					
Understand	10	10	10	20					
Apply	30	30	30	60					
Analyze	1								
Evaluate									
Create									

Passed in Board of studies Meeting 25.02.2022



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20CS503	OBJECT ORIENTED ANALYSIS AND DESIGN	
Nature of Course	(Common to CSE, IT & AI&DS)	
Pre requisites	OOPS Concept	

## **Course Objectives**

The course is intended to

- 1. Impart the knowledge on the fundamentals of object modeling
- 2. Differentiate Unified Process from other approaches
- 3. Design with static UML diagrams
- 4. Improve the software design with design patterns
- 5. Test the software against its requirements specification

#### **Course Outcomes**

On successful completion of the course, students will be able to CONO

CO.NO.	Course Outcome	Bloom's
CO1.	Express software design with LIML diagrams	Level
CO2.	Design software applications using OO concents	Understand
CO3.	Identify various sceparios based on settuine	Understand
CO4.	Transform LIML based software desire	Apply
	design patterns	Analyze
CO5.	Understand the various testing methodologies for OO software	Analyzo

#### **Course Contents**

#### UNIT I

## UNIFIED PROCESS AND USE CASE DIAGRAMS

Introduction to OOAD with OO Basics - Unified Process - UML diagrams - Use Case -Case study - the Next Gen POS system, Inception -Use case Modelling - Relating Use cases include, extend and generalization - When to use Use-cases.

#### UNIT II STATIC UML DIAGRAMS

Class Diagram- Elaboration - Domain Model - Finding conceptual classes and description classes - Associations - Attributes - Domain model refinement - Finding conceptual class Hierarchies - Aggregation and Composition - Relationship between sequence diagrams and use cases - When to use Class Diagrams.

#### UNIT III DYNAMIC AND IMPLEMENTATION UML DIAGRAMS

Dynamic Diagrams - UML interaction diagrams - System sequence diagram - Collaboration diagram - When to use Communication Diagrams - State machine diagram and Modelling -When to use State Diagrams - Activity diagram - When to use activity diagrams. Implementation Diagrams - UML package diagram - When to use package diagrams -

Component and Deployment Diagrams - When to use Component and Deployment diagrams.

#### **UNIT IV DESIGN PATTERNS**

GRASP: Designing objects with responsibilities - Creator - Information expert - Low Coupling -High Cohesion - Controller.

Design Patterns - creational - factory method - structural - Bridge - Adapter - behavioural -Strategy - observer - Applying GoF design patterns - Mapping design to code.

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#### UNIT V TESTING

Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans.

#### Total: 45Periods

9

Labora	tory Components:		
S.No	List of experiments	CO Mapping	RBT
1.	Identify a software system that needs to be developed.	CO1	Understand
2.	Document the Software Requirements Specification (SRS) for the identified system.	CO2	Understand
3.	Identify use cases and develop the Use Case model.	CO3	Apply
4.	Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.	CO4	Apply
5.	Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams	CO5	Apply
6.	Draw relevant State Chart and Activity Diagrams for the same system.	CO1	Apply
7.	Implement the system as per the detailed design	CO2	Apply
8.	Test the software system for all the scenarios identified as per the use case diagram	CO3	Apply
9.	Improve the reusability and maintainability of the software system by applying appropriate design patterns.	CO4	Apply
10.	Implement the modified system and test it for various scenarios	CO5	Apply

#### **Total: 30 Periods**

#### **Text Books:**

- 1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition 2005.
- 2. Ali Bahrami "Object Oriented Systems Development ", McGraw Hill International Edition 1999.

#### Reference Books:

- 1. Martin fowler, "uml distilled: a brief guide to the standard object modeling language", third edition, addison wesley, 2003
- 2. Erich gamma, a n d richard helm, ralph johnson, john vlissides, "design patterns: elements of reusable object-oriented software", addison-wesley, 1995.

### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105153/
- 2. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-cs25/
- 3. https://nptel.ac.in/courses/106/105/106105224/

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COs	-			1	1	-	PO	s						PSOs	-
CO1	- 1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO2	3	2	1	1									3	1	
CO3		2	2	1	2						2	2	3	1	
01	3	2	1	1									3	1	
	3	3	2	1	2	1		1			1	2	0		
CO5	3	3	2	2	2	1		1	- 1		2	2	3	1	
000	3	3 High	2 ו	2	2	1 2	Med	1 ium			3	2	3 Low	1	

			Summati	ve Assessment		18
			Continuou	is Assessment		
Bloom's			Theory		Practicals	Final Examination (Theory) [50] 10 20
Level	-					Examination
	IAE-I [7.5]	IAE- II [7.5]	IAE-III [10]	Attendance [5]	CIA[2 01	(Theory) [50]
Remember	10	10	10			10
Understand	20	20	20	_	10	10
Apply	20	20	20		10	20
Analyze			20		20	50
Evaluate					20	20
Create						

Passed in Board of studies Meeting 25.02.2022



Approved in Academic Council Meeting 09.03.2022

0000504		L	T	P	С
2005504	CLOUD COMPUTING SERVICES	3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Distributed Systems				

#### Course objectives:

#### The course is intended to

- 1. Comprehend the concept of cloud computing.
- 2. Recognize the underlying principles of virtualization.
- 3. Gain knowledge on various architectures, services and storage security issues and risk management.
- 4. Explore the cloud security concerns.
- 5. Learn the emergence of cloud as the next generation computing paradigm.

#### Course Outcomes:

On successful completion of the course, students will be able to

CO.NO	Course Outcome	Bloom's Level
CO1	Describe the different types of cloud models and services for building an efficient cloud computing environment	Understand
CO2	Apply the virtualization technologies and capacity planning techniques to create shared resource pools	Apply
CO3	Analyze the ability to understand and use the architecture of compute and storage cloud, service and delivery models.	Analyze
CO4	Evaluate the core issues of cloud computing such as resource management and security.	Evaluate
CO5	Create and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.	Create

#### Course Contents:

#### UNIT I INTRODUCTION

Introduction to Cloud Computing - Definition of Cloud - Evolution of Cloud Computing - Underlying Principles of Parallel and Distributed Computing - Cloud Characteristics - Elasticity in Cloud - Ondemand Provisioning.

#### UNIT II VIRTUALIZATION AND CAPACITY PLANNING

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms - Virtualization of CPU - Memory - I/O Devices -Virtualization Support and Disaster Recovery-Capacity Planning: Defining Baseline and Metrics-Networks Capacity.

#### UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE

Layered Cloud Architecture Design - NIST Cloud Computing Reference Architecture - Public, Private and Hybrid Clouds - laaS - PaaS - SaaS - Architectural Design Challenges - Cloud Storage -Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

## UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD

Inter Cloud Resource Management - Resource Provisioning and Resource Provisioning Methods -Global Exchange of Cloud Resources - Security Overview - Cloud Security Challenges - Software-asa-Service Security - Security Governance - Virtual Machine Security - IAM - Security Standards.

Passed	in	Board	of	studies	Meeting	25.02.2022
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Approved in Academic Council Meeting 09.03.2022

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#### 8

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### UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS

 8

 Hadoop – Map Reduce – Virtual Box – Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation, AWS, Microsoft Azure.

#### Laboratory Components

#### Total: 45 Periods

S.No	List of Experiments	CO Mapping	RBT
1	Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows7 or 8	C01	Apply
2	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.	CO1	Apply
3	Install Google App Engine. Create hello world app and other simple web applications using python/java.	CO2	Apply
4	Use GAE launcher to launch the web applications.	CO2	Apply
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.	CO3	Apply
6	Find a procedure to transfer the files from one virtual machine to another virtual machine.	CO4	Apply
7	Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version).	CO5	Apply
8.	Install Hadoop single node cluster and run simple applications like word count.	CO5	Apply
9.	Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.	CO5	Apply

#### **Total: 30 Periods**

#### Text Books:

- 1. Rittenhouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.
- 2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

#### References:

- 1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata McGraw Hill, 2013.
- 2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing A Practical Approach", Tata McGraw Hill, 2009.
- 3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.

#### Additional References:

- 1. https://nptel.ac.in/courses/117/105/117105080/
- 2. https://nptel.ac.in/courses/108/105/108105113/
- 3. https://onlinecourses.nptel.ac.in/noc20\_ee70/preview

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	Ŭ		2						gra	Dutcor	nes (P	SOs)	ograi	n opec	,1110
Cos		Pos PSOs													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	1
CO1	3	3	1								1	2	3	1	
CO2	3	2	2		2						2	2	3	1	
CO3	3	3	2		2						2	2	3	1	
CO4	3	2						-			1	2	3	1	-
CO5	3	2	2		2		-		-		3	2	3	1	
	3		Hig	gh	U.S.	2		1	Vediur	n		1	0	Low	

		Sur	nmative Ass	essment		
		Con	tinuous Asso	essment		
		Tł	neory		Practical's	å.
Bloom's Level	IAE – I (7.5)	IAE – II (7.5)	IAE – III (10)	Attendance (5)	Rubric based CIA (20)	Final Examination (Theory) (50)
Remember	30	20	10		20	40
Understand	10	20	30		20	40
Apply	10	10	10		10	20
Analyze						
Evaluate						
Create						

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20CS505	COMPILER DESIGN LABORATORY	L	Т	P	C
Nature of Course	Professional Core	0	0	2	1
Pre requisites	Problem Solving using Python				

## **Course Objectives**

The course is intended to

- 1. Make use of LEX tool to recognize tokens and generate the finite automata.
- 2. Generate a parser for the given grammar.
- 3. Exploit YACC tool to perform syntax analysis.
- 4. Implement back-end of the compiler to generate Assembly code.
- 5. Implement code optimization Techniques for Intermediate Code.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. NO.	Course Outcome	
CO1	Apply LEX tool to recognize to low in the	Bloom's Level
CO2	Design a parcet for the site	Apply
CO3	Make use of XACC to all the frammar	Apply
CO4	Make use of FACC tool to perform syntax analysis	Apply
004	Generate Assembly code for the given three address code	Apply
	Apply code optimization techniques for intermediate code	Apply

#### List of Exercises

S.No	List of Exercises	CO Mapping	RBT	
1	Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, Comments, operators etc.). Create a symbol table, while recognizing identifiers	CO1	Apply	
2	Design NFA from the given Regular expression	CO1	Apply	
3	Implement an Arithmetic Calculator using Yacc	001	Apply	
4	Using LEX, generate the finite automata for a given pattern	CO1	Apply	
5	Implement Shift Reduce Parsing	CO2	Apply	
6	Implement Predict parser of the given grammar	002	Apply	
7	Implement Operator Precedence Parsing	002	Apply	
8	Generate three address codes for a simple program	CO4	Apply	
9	Implement back-end of the compiler for which the three-address code is given as input and the assembly language code is produced as output	CO4	Apply	
10	Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)	CO5	Apply	

TOTAL: 30 Periods

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Mapping o	of Cour	se Ou	itcom	es (C	Os) v (	with Outc	Prog omes	ramn s (PS	ne Ou Os)	itcom	es (P	Os) P	rogrami	ne Spe	cific
				PSOs											
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2		3		5 <u>-</u> 5		-		-	-		3	
CO2	3	2	2		-	141		-		-		•		3	
CO3	3	2	2	-	3	-	+	-	-	-	-	<u>, 1</u> 22	-	3	
CO4	3	2	2	-	-	-	-		-	-	-	-	-	3	-
CO5	3	2	2	-	-	-		-	-	-			-	3	-
	3		Hi	gh		2	-	N	/ Aediu	m		1	Low		1

	Assessment based on Con	tinuous and Final Exa	mination
	Continuous Assessm (Attendance –	nent (50 marks) 5 marks)	Final Examine (
Bloom's Level	Rubric based Continuous	Model	Final Examination
	Assessment [25 marks]	Examination [20 marks]	[30 marks]
Remember			
Understand	40	40	40
Apply	60	60	60
Analyze			
Evaluate			
Create			

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#### SEMESTER VI

20CS601 Vature of Course Prerequisites	MACHINE LEARNING TECHNIQUES	L	Τ	Ρ	С
	(Common to CSE, IT and AI&DS)	3	0	0	3
Nature of Course	Professional Core				-
Prerequisites	Foundations of Artificial Intelligence			6	

#### **Course Objectives**

The course is intended to

- 1. Discover the basic concepts and techniques of machine learning.
- 2. Have a thorough understanding of the Supervised and Unsupervised learning techniques
- 3. Be familiar with various probability based learning techniques
- 4. Acquire knowledge on dimensionality reduction and Evolutionary models.
- 5. Understand graphical models of machine learning algorithms

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1,	Distinguish between, supervised, unsupervised and semi-supervised learning	Understand
CO2.	Apply the appropriate machine learning strategy for any given problem	Apply
CO3.	Suggest the appropriate machine learning approach for the various types of problem	Apply
CO4.	Identify various dimensionality reduction and Evolutionary models	Understand
CO5.	Design systems that uses the appropriate graph models of machine learning	Apply

## **Course Contents:**

#### UNIT I INTRODUCTION

Learning - Types of Machine Learning - Supervised Learning - The Brain and the Neuron - Design a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task - Concept Learning as Search - Finding a Maximally Specific Hypothesis - Version Spaces and the Candidate Elimination Algorithm - Linear Discriminants - Perceptron - Linear Separability - Linear Regression.

#### UNIT IL LINEAR MODELS

Multi-layer Perceptron - Going Forwards - Going Backwards: Back Propagation Error - Multilayer Perceptron in Practice - Examples of using the MLP - Overview - Deriving BackPropagation - Radial Basis Functions and Splines - Concepts - RBF Network - Curse of Dimensionality - Interpolations and Basis Functions - Support Vector Machines.

#### UNIT III TREE AND PROBABILISTIC MODELS

Learning with Trees - Decision Trees - Constructing Decision Trees - Classification and Regression Trees - Ensemble Learning - Boosting - Bagging - Different ways to Combine Classifiers - Probability and Learning - Data into Probabilities - Basic Statistics - Gaussian Mixture Models - Nearest Neighbor Methods - Unsupervised Learning - K means Algorithms - Vector Quantization - Self Organizing Feature Map

#### UNIT IV DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS

Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis - Factor Analysis - Independent Component Analysis - Locally Linear Embedding - Isomap - Least Squares

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Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process.

#### UNIT V GRAPHICAL MODELS

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

#### Text books:

Total: 45 Periods

9

- 1. Ethem Alpaydin, —Introduction to Machine Learning, (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014
- 2. Jason Bell, —Machine learning Hands on for Developers and Technical Professional, First Edition, Wiley, 2014.

#### **References:**

- 1. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Datall, First Edition, Cambridge University Press, 2012.
- 2. Stephen Marsland, —Machine Learning An Algorithmic Perspectivell, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
- 3. Tom M Mitchell, --Machine Learningli, First Edition, McGraw Hill Education, 2013.

Mapping of Course Outcome	s (COs) with Programme Outcome	s (POs) Programme Specific
Outcomes (PSOs)		
	Pos	PSOs

				PSOs											
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1										3	1	
CO2	3	2	1										3	1	
CO3	3	2	2										3	1	
CO4	3	2	2										3	1	
CO5	3	2	2										3	1	
	3	Hig	յh			2	Me	diun	1			1	Low		

Formative assessm	nent		
Bloom's Level	Assessment Component	Marks	Total marks
Apply	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
	Attendance	.5	

Summative Assessment	Summative Assessment									
Bloom's Category	Continu	nt Tests	Final							
	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination (60)						
Remember	10	10	10	10						
Understand	20	20	20	50						
Apply	20	20	20	40						
Evaluate	0	0	0	0						
Create	0	0	0	0						

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20CS602	20CS602     PROFESSIONAL ETHICS AND HUMAN VALUES       ature of Course     Humanities and Social Sciences       re requisites     Nil	L	Т	P	С
Nature of Course	Humanities and Social Sciences	3	0	0	3
Pre requisites	Nil				

### **Course Objectives**

The course is intended to

- 1. Create awareness on engineering ethics and human values.
- 2. Instill Moral and Social Values and Loyalty.
- 3. Learn about the social responsibility of an engineer.
- 4. Create awareness on assessment of safety and risk.
- 5. Judge a global issue by presenting an optimum solution.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Computer engineering ethics theory with sustained lifelong learning.	Understand
CO2	Adopt a good character and follow high professional ethical life.	Understand
CO3	Assess their own ethical values and the social context of problems	Understand
CO4	Confront and resolve moral issues occurred during technological activities	Understand
CO5	Resolve moral and ethical problems through exploration and assessment by established experiments.	Apply

#### Course Contents:

#### UNIT - I HUMAN VALUES

Morals and Ethics - Honesty - Integrity - Values - Work Ethic - Civic Virtue - Respect for Others -Living Peacefully - Caring and Sharing - Self-Confidence - Courage - Co-operation - Commitment -Empathy.

### **UNIT - II ENGINEERING ETHICS**

Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of professional roles - Theories about right action - Self-interest - Customs and Religion - Uses of Ethical Theories.

## UNIT - III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics - A Balanced Outlook on Law.

## UNIT - IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis and Reducing Risk - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime -Professional Rights - Employee Rights - Intellectual Property Rights (IPR) - Discrimination.

#### UNIT -V GLOBAL ISSUES

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development -Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors -Moral Leadership -Code of Conduct - Corporate Social Responsibility.

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### Total: 45 Periods

#### Text Books:

- 1. Mike W Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 4th edition, 2014.
- 2. M.Govindarajan, S. Natarajan and V S Senthil Kumar, "Engineering Ethics", PHI Learning Private Ltd, New Delhi, 2012.

#### **Reference Books:**

- 1. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi 2013.
- Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics Concepts and Cases", Cengage Learning, 2009.
- 3. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.

#### Additional References:

- 1. https://nptel.ac.in/courses/109/104/109104068/
- 2. https://www.youtube.com/watch?v=3-UEi\_djb7w
- 3. https://nptel.ac.in/courses/109/106/109106117/

Cos		Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	2			-	-	3	2	-	2	-	2		
CO2	-	-	÷	-	-	-		2	2	-	2		3		
CO3	-	-	-	-	-	-		2	2	-	2		1		-
CO4	-		-	-	-	-	-	2	2		2		1		
CO5	-				-		-	2	1		2		1		

Formative assessment									
Bloom's Level	Assessment Component	Marks	Total						
Remember	Online Quiz	5	marks						
Understand	Tutorial Class / Assignment	5	15						
	Attendance	5	- 15						

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
	IAE - I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	(00)
Understand	10	10	10	20
Apply	10	10	10	20
Analyze	30	30	30	60
Evaluate		the second second		
Create	5			

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20CS603	DATA ANALYTICS	LITE
Nature of Course	(Common to CSE & IT)	
Pre requisites	Database Management systems	

## **Course Objectives**

The course is intended to

- 1. Understand the Big Data Platform and its Use cases
- 2. Explore the HDFS Concepts and Interfacing with HDFS
- 3. Perform Map Reduce Jobs
- 4. Be responsible for hands on Hadoop Eco System
- 5. Discover data analytics with R

### Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's
CO1,	Identify Big Data and its Business Implications	Level
CO2.	Access and Process Data on Hadoon Distributed File Cust	Understand
CO3.	Manage Job Execution in Hadoon Environment	Understand
CO4	Develop Big Data Solutions using the to 5	Apply
005	Apply the data with D	Analyze
000.	Analyze the data with K	Analyze

#### **Course Contents**

## UNIT I INTRODUCTION TO BIG DATA AND HADOOP

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets.

## UNIT II HDFS (HADOOP DISTRIBUTED FILE SYSTEM)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, DataIngest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

### UNIT III MAP REDUCE

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

### Unit IV HADOOP ECO SYSTEM

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Shell, Hive Services, Hive Megastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL: Introduction.

#### UNIT V DATA ANALYTICS WITH R

Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

**Total: 45Periods** 

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#### TEXT BOOKS:

- 1. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.
- 2. Tom White "Hadoop: The Definitive Guide" O'reily Media, 3rd Edition 2012.

#### **REFERENCES:**

- 1. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013).
- 2. AnandRajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- 3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.

#### Additional References:

- 1. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-mg24/
- 2. https://onlinecourses.nptel.ac.in/noc21\_cs45/preview
- 3. https://nptel.ac.in/courses/110/106/110106072/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes(PSOs)

00		POs											PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	1	1									3	1		
CO2	3	2	2	1	2						2	2	3	1		
CO3	3	2	1	1									3	1		
CO4	3	3	2	1	2	1		1			1	2	3	1		
CO5	3	3	2	2	2	1		1			3	2	3	1		
	3	Hig	h			2	Med	dium				1	Low		1	

Formative Assessment			
Bloom's Level	Assessment Component	Marks	Total mark s
Apply	Class room or Online Quiz	5	
Understand	Class Presentation / PowerPoint presentation	5	15
	Attendance	5	

Bloom's Category	Cont	Final		
	IAE-I (7,5)	IAE-II (7.5)	IAE-III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	10	10
Apply	20	20	10	30
Apply	20	20	20	40
Analyze	0	0	10	20
Evaluate	0	0	0	20
Create	0	0	- 0	0
	0	0	0	0

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20CS604	WEB TECHNOLOGY	L	T	Ρ	С
		3	0	2	4
Nature of Course	Professional Core		-	-	<u> </u>
Pre requisites	NIL		1	_	

#### **Course Objectives**

The course is intended to

- 1. Be familiar with client-server communication and protocols.
- 2. Design interactive web pages using Scripting languages.
- 3. Learn server side programming using Servlets.
- 4. Develop web pages using JSP.
- 5. Acquire knowledge on web services and their interactions.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Recognize best technologies for solving web client/server problems.	Understand
CO2.	Apply Cascading Style Sheet to design a HTML Webpage and Develop a HTML form and validate it using Java Script.	Apply
CO3.	Solve integrate java and server side scripting languages to develop web applications.	Apply
CO4.	Deploy real time web applications in web servers and in the cloud.	Apply
CO5.	Demonstrate the use of XML in the web service platform.	Apply

#### **Course Contents**

### UNIT I WEB SITE BASICS AND HTML

Web Essentials: Clients, Servers, and Communication. WWW - HTTP request and response message. Markup Languages: XHTML. Introduction to HTML - Basic XHTML Syntax and Semantics-Fundamental HTML Elements – Lists – tables – Frames – Forms - HTML 5.0.

#### UNIT II CSS AND CLIENT SIDE SCRIPTING

CSS – Features - Syntax - Cascading and Inheritance - Text Properties - Box Model - Flow - Other style Properties. JavaScript introduction - Basic Elements – Variable - Data Types - Operators and Literals-Functions – Objects – Arrays - Built-in - Object.

#### UNIT III SERVER SIDE SCRIPTING

Server-Side Programming: Java Servlets - Architecture -Overview- Servlet - Generating Dynamic Content - Life Cycle - Parameter Data – Sessions – Cookies, Node.Js - Introduction, JSON.

#### UNIT IV JSP

JSP Overview - Basic JSP: Architecture – Lifecycle – Directives – Actions - Implicit Objects - JavaBeans Classes and JSP - MVO Paradigm - Databases and JSP.

#### UNIT V XML and WEB SERVICES

Xml: Namespaces - XML Processing - XML Documents - X-Path - X-Link, X-Query, XSL - XSLT, Web services: WSDL- XML Schema - Introduction to SOAP, UDDI.

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#### Total: 45 Periods

S.No	List of Experiments	CO Mapping	RBT
1	Create a web page with the following using HTML. To embed an image map in a web page. To fix the hot spots. Show all the related information when the hot spots are clicked.	CO1	Apply
2	Create a web page with all types of Cascading style sheets.	CO2	Apply
3	Client Side Scripts for Validating Web Form Controls using DHTML.	CO3	Apply
4	Installation of Apache Tomcat web server.	CO4	Apply
5	Write programs in Java using Servlets: To invoke servlets from HTML forms. Session Tracking.	CO5	Apply
6	Write programs in Java to create three-tier applications using JSP and Databases For conducting on-line examination. For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.	CO1	Apply
7	Programs using XML – Schema – XSLT/XSL.	CO2	Apply
9	Programs using DOM and SAX parsers.	CO3	Apply

#### **Text Books**

### **TOTAL: 30 PERIODS**

- 1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", 8th Edition, Pearson Education, 2020
- 2. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2007.

#### **Reference Books**

- 1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2015.
- 2. Marty Hall and Larry Brown, "Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.

COc		Pos											PSOs		
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	1	1						1	2	2	3	
CO2	3	2	3	1	1						2	2	2	3	
CO3	3	2	3	1	2						2	2	2	3	
CO4	3	2	3	2	2						2	2	2	3	
CO5	3	2	3	2	2						2	2	2	3	
	3	Hig	h			2	Med	dium		de de		1	Low		

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		Su Cor	Immative As Intinuous As:	sessment sessment		ľ
		The	ory		Practicelle	Final
Bloom's Level	(7.5)	IAE II (7.5)	IAE – III (10)	Attendance (5)	Rubric based CIA	Examination (Theory)
Remember	10	10	10		(20)	(50)
Understand	20	20	10			10
Apply	20	20	10			50
Analyze	2.0	10	30		30	30
Evaluate		10			20	10
Create						10

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20CS605	MACHINE LEARNING LABORATORY	L	Т	Ρ	С
2000000	(Common to CSE, IT and AI&DS)	0	0	4	2
Nature of Course	Professional Core	0	11		
Prerequisites	NIL				

#### **Course Objectives**

The course is intended to

- 1. Make use of Data sets in implementing the machine learning algorithms
- 2. Implement the machine learning concepts and algorithms in any suitable language of choice,
- 3. Propose appropriate data sets to the Machine Learning algorithms
- 4. Identify the appropriate algorithms for real world problems.
- 5. Demonstrate Machine learning with readily available data.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Implement the procedures for the machine learning algorithms.	Apply
CO2,	Design Java/Python programs for various Learning algorithms.	Apply
CO3.	Classify appropriate data sets to the Machine Learning algorithms.	Apply
CO4.	Apply Machine Learning algorithms to solve real world problems.	Apply
CO5.	Perform experiments in Machine Learning using real-world data.	Analyze

#### List of Exercises:

S. No	List of Exercises	CO Mapping	RBT
1	Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.	CO1	Apply
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	CO1	Apply
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	CO2	Apply
4	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.	CO2	Apply
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	CO3	Apply
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set	СОЗ	Apply
7	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.	CO4	Apply

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8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.	CO4	Apply
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.	CO5	Apply
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	CO5	Apply

#### Total: 30 Periods

Mapping of Outcomes	f Course Outcomes (CO) with Programme Outcomes (PO (PSO)	) Programme Specific
	Pos	PSOs

		FUS												PSOs	
Cos	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1									3	1	
2	3	2	2	1	2		9				2	2	3	1	
3	3	2	1	1	1								3	1	
- 4	3	3	2	1	2	1	_	1			1	2	3	1	
5	3	3	2	2	2	1		1			3	2	3	1	
	3		Н	igh		2		Ň	lediu	m		1	L	j j w	

Bloom's Level	Rubric based Continuous Assessment [50 marks]	End Semester Examination [50 marks]
Remember		[ee marke]
Understand	10	20
Apply	20	50
Analyze	20	30
Evaluate		
Create		

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20CS606	MINI PRO JECT	L	T	Ρ	С
	WINTFROJECT	0	0	2	1
Nature of Course	EEC	_			
Pre requisites	Basics of Programming Languages, Software Engineering			-	

#### **Course Objectives**

The course is intended to

- 1. Develop their own innovative prototype of ideas.
- 2. Train the students in preparing mini project reports and examination.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
1.	Take up their final year project work.	Apply
2.	Find solution by formulating proper methodology.	Evaluate

#### **Course Contents**

- 1. The students in a group of 5 to 6 works on a topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction.
- 2. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department.
- 3. A mini project report is required at the end of the semester.
- 4. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

**TOTAL: 30 PERIODS** 

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## PROFESSIONAL ELECTIVES (PE)

# STREAM I ARTIFICIAL INTELLIGENCE & MACHINE LEARNING:

20CSE01	DEEP LEARNING TECHNIQUES	Ľ	Т	P	С
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Foundations of Artificial Intelligence				

#### **Course Objectives**

The course is intended to

- 1. Learn the fundamentals concepts and techniques of deep Learning.
- 2. Acquire the knowledge of deep networks.
- 3. Familiarize with the basic concepts of dimentionality reduction.
- 4. Get Knowledge about optimization and generalization.
- 5. Create the applications of Bioinformatics.

#### Course Outcomes

On successful completion of the course, students will be able to

CO. NO.	Course Outcome	Bloom's Level
CO1.	Apply the fundamental knowledge of deep learning.	Apply
CO2.	Use learning methods of deep networks.	Apply
CO3.	Identify the basic concepts of dimentionality reduction.	Apply
CO4.	Get Knowledge about optimization and generalization.	Apply
CO5.	Design the models for Bioinformatics using deep learning systems.	Create

#### Course Contents:

#### **UNIT - LINTRODUCTION**

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression) - Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

#### **UNIT - II DEEP NETWORKS**

Q History of Deep Learning- A Probabilistic Theory of Deep Learning Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolution Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

#### UNIT -III DIMENTIONALITY REDUCTION

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures - AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.

### UNIT - IV OPTIMIZATION AND GENERALIZATION

Optimization in deep learning- Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM -Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning -Computational & Artificial Neuroscience.

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#### UNIT – V CASE STUDY AND APPLICATIONS

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection-Bioinformatics- Face Recognition- Scene Understanding Gathering Image Captions.

#### **Text Books:**

Total: 45 Periods

9

- 1. Cosma Rohilla Shalizi, "Advanced Data Analysis from an Elementary Point of View", Cosma Rohilla Shalizi, 2nd Edition 2021.
- 2. Deng & Yu, "Deep Learning: Methods and Applications", Now Publishers, 1st Edition 2020.

#### **Reference Books:**

- 1. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, Edition 2017.
- 2. Ian Good fellow, "Yoshua Bengio, Aaron Courville, Deep Learning", MIT Press, Edition 2016.
- 3. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, Edition 2015.

Марј	oing o	f Cour	se Ou	tcome	s (CO)	with l Oເ	Progra	imme ( es (PS)	Outco O)	mes (P	O) and	d Prog	ramm	e Spec	cific
COs						P	Os							<b>PSOs</b>	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	1	2						1	1	3	2	1
CO2	3	3	3	1	2						1	1	3	2	1
CO3	3	3	3	1	2						1	1	3	2	1
CO4	3	3	3	1	2						1	1	3	2	1
CO5	3	3	3	1	2						1	1	3	2	1
	3		High			2		Mediur	n		1		Low		

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
	Attendance	5	

	Su	Immative Asses	ssment	
	Continu	ous Assessme	nt Tests	Tampinal Francis attac
Bloom's Category	IAE1 (7.5)	IAE2 (7.5)	IAE3 (10)	(60)
Remember	0	0	0	0
Understand	10	10	10	10
Apply	20	20	20	20
Analyze	20	20	20	20
Evaluate	0	0	0	0
Create	0	0	0	0

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20CSE02	NEURAL NETWORKS AND FUZZY LOGIC	L	Т	P	С
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Foundations of Artificial Intelligence				

### **Course Objectives**

The course is intended to

- 1. Learn the fundamentals concepts of Fuzzy logic.
- 2. Acquire the knowledge of Architecture neural networks.
- 3. Familiarize with the basic concepts of Neural Network Techniques.
- 4. Introduce competitive neural network to solve real world complex problem.
- 5. Understand the applications of neural networks and fuzzy logic.

#### Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	
CO1.	Apply the fundamental leave of 5	Bloom's Level
CO2	Lise learning methods for the second se	Apply
002.	Use learning methods of Architecture neural networks.	Apply
003.	Identify the basic concepts of neural network techniques	Apply
CO4.	Get Knowledge about competitive neural network	Apply
CO5.	Apply Neural Networks and fuzzy logic for real-time applications	Apply
		Apply

#### **Course Contents:**

## UNIT - I FUNDAMENTALS OF FUZZY LOGIC

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union-9 intersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems.

## UNIT - II ARCHITECTURE OF NEURAL NETWORKS

Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions Basic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron -Convergence theorem-Delta rule.

### UNIT III BASIC NEURAL NETWORK TECHNIQUES

9 Back propagation neural net:standard back propagation-architecture algorithm- derivation of learning rules-number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine.

#### Unit - IV COMPETITIVE NEURAL NETWORKS

9 Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2.

#### UNIT - V SPECIAL NEURAL NETWORKS

Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems.

**Total: 45 Periods** 

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#### Text Books:

- 1. Laurene V. Fausett- "Fundamental of Neural network" Pearson Education India; 1st edition (1 January 2004).
- 2. George J.Klir/Bro Yuvan "Fuzzy Sets & Fuzzy Logic" Prentice Hall PTR, Fourth Edition 2003.

#### **Reference Books:**

- 1. J.M.Zurada, "Introduction to artificial neural systems" Jaico Publication house, Delhi 2016.
- 2. Hans Jurgen Zimmermann "Fuzzy Set Theory" Springer; 2nd edition 2014.
- 3. Bart Kosko,"Neural network and Fuzzy System" Prentice Hall-1994.

#### Additional References:

- 1. https://nptel.ac.in/courses/108/104/108104049/
- 2. https://nptel.ac.in/courses/127/105/127105006/
- 3. https://onlinecourses.nptel.ac.in/noc21\_ge07/preview

	POs POs							0	PSOs	_					
.*	1	2	3	4	5	6	7	8	9	10	11	12	1	2	2
CO1	3	2	1	1			1		12				2	4	
CO2	3	2	1	1						-			3	1	-
CO3	3	3	2	1				-					3	1	
004	0	- 0	2										3	1	
C04	3	3	2	1									3	1	
CO5	3	2	2	1									0	-	

	Formative assessment					
Bloom's Level	Assessment Component	Marks	Total marks			
Remember	Online Quiz	5				
Understand	Tutorial Class / Assignment	5	15			
	Attendance	5	- 15			

	Summ	ative Assessme	nt	
Bloom's Cataran	Interna	al Assessment I	Examinations	
Bioonin's Category	IAE - I (7.5)	IAE - II (7.5)	IAE - III (10)	Final Examination (60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	20	10	10	20
Analyze		30	30	60
Evaluate				
Create				

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20CSE03	ROBOTICS AND INTELLIGENT SYSTEMS	L	T	Ρ	С
		3	0	0	2
Nature of Course	Professional Elective			0	5
Pre requisites	Foundations of Artificial Intelligence			-	

#### **Course Objectives**

The course is intended to

- 1. Learn the basic principles, techniques, and applications of Artificial Intelligence.
- 2. Study about different search techniques and game playing strategies.
- 3. Understand the use of logic and ontology to construct computable models for given domains.
- 4. distinguish class of problems suitable for solving with expert systems
- 5. Illustrate the models for robotics using intelligent systems

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level	
CO1.	Understand basic principles, techniques, and applications of Artificial Intelligence	Understand	
CO2.	Design intelligent agents for Heuristic Search Techniques and Game Playing	Apply	
CO3.	Implement frameworks used for logic and knowledge representation	Apply	
CO4.	Develop models for Knowledge Acquisition and Expert System	Apply	
CO5.	Apply models for robotics using intelligent systems	Apply	

#### **Course Contents:**

### UNIT - I INTRODUCTION TO AI AND PROBLEM REPRESENTATION

Introduction: Artificial Intelligence (AI) and its importance, AI Problems (tic tac toe problem, water jug problems), Application area of Al. Problem Representations: State space representation, problemreduction representation, production system, production system characteristics and types of production system.

### UNIT - II HEURISTIC SEARCH TECHNIQUES AND GAME PLAYING

Heuristic Search Techniques :AI and search process, brute force search, depth-first search, breadthfirst search, time and space complexities, heuristics search, hill climbing, best first search, A\* algorithm and beam search, AO search, constraint satisfaction. Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing strategies, problems in game playing.

#### UNIT – III LOGIC AND KNOWLEDGE REPRESENTATION

Knowledge Representation and Structured Knowledge: Associative networks, frame structures, conceptual dependencies and scripts, ontologies. Logic: Prepositional logic: syntax and semantics, First Order Predicate Logic (FOPL): Syntax and semantics, conversion to clausal form, inference rules, unification, and the resolution principles. .

### UNIT - IV KNOWLEDGE ACQUISITION AND EXPERT SYSTEM

Knowledge Acquisitions: Type of learning, Knowledge Acquisition, Early work in machine learning, learning by induction. Expert System: Introduction to expert system, Phases of expert system, characteristics of expert system and a case study; Introduction of Executive Support System and Decision Support System.

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#### **UNIT – V ROBOTICS AND ITS APPLICATION**

Robotics and Its applications, DDD concept, Intelligent robots, Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system

#### Text Books:

Total: 45 Periods

9

- 1. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", McGraw Hill, 3rd edition, 2017.
- 2. S.R. Deb, S. Deb, "Robotics Technology and Flexible Automation", Tata McGraw-Hill Education., 1st edition, 2009.
- 3. Max Braber, "Logic Programming with Prolog", Springer, 1st edition, 2005.

#### Reference Books:

- 1. Laxmidhar Behera, Swagat Kumar, Prem Kumar Patchaikani, Ranjith Ravindranathan Nair, Samrat Dutta, "Intelligent Control of Robotic Systems", CRC press, 1st edition, 2020. 2. V. S. Janakiraman, K. Sarukesi, P. Gopalakrishnan, "Foundations of Artificial Intelligence and
- Expert Systems", Macmillan India Limited, 1st edition, 2000.
- 3. Dan W. Patterson, "Introduction to AI and Expert System", PHI, 1st edition, 1990.

#### Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc19 me74/preview
- 2. https://nptel.ac.in/courses/106/102/106102220/
- 3. https://nptel.ac.in/courses/106/105/106105077/

Марр	ing of	Cours	e Out	comes	(COs	) with Outc	Progra omes	amme (PSOs	Outco )	mes (F	POs) P	rograr	nme S	pecifi	С
00						P	Os						F	SOs	
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3							3	3	3	3
CO2	3	3	3	3	3							3	3	3	3
CO3	3	3	3	3	3		-				_	3	3	3	3
CO4	3	3	3	3	3							3	3	3	3
CO5	3	3	3	3	3						17	3	3	3	3
	3 High					2		Medium 1				Lo	ow		

Formative assessment									
Bloom's Level	Assessment Component	Marks	Total marks						
Apply	Classroom or Online Quiz	5							
Understand	Class Presentation/Power point presentation	5	15						
	Attendance	5							

	Summ	ative Assessme	nt	
	Continu	Final		
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	20	40
Apply	20	20	20	50
Evaluate	0	0	0	0
Create	0	0	0	0

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20CSE04	BUOWINGS W				11
	BUSINESS INTELLIGENCE	L	T	P	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Data Analytics				-

# **Course Objectives**

The course is intended to

- 1. Understand the Analytics Life Cycle.
- 2. Comprehend the process of acquiring Business Intelligence.
- 3. Understand various types of analytics for Business Forecasting.
- 4. Model the supply chain management for Analytics.
- 5. Apply analytics for different functions of a business.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outer	
001	Identify the real world business problems and such the interview	Bloom's Level
CO1.	solutions	Understand
CO2.	Identify the business processes for extracting Business Intelligence	
CO3.	Apply predictive analytics for business fore casting	Understand
CO4.	Apply analytics for supply chain and logistics menory	Apply
CO5	Use analytics for marketing and actu	Apply
	and sales	Apply

#### Course Contents:

# UNIT - I INTRODUCTION TO BUSINESS ANALYTICS

Analytics and Data Science - Analytics Life Cycle - Types of Analytics - Business Problem Definition -Data Collection - Data Preparation - Hypothesis Generation - Modeling - Validation and Evaluation -Interpretation - Deployment and Iteration.

## **UNIT – II BUSINESS INTELLIGENCE**

Data Warehouses and Data Mart - Knowledge Management - Types of Decisions - Decision Making Process - Decision Support Systems - Business Intelligence - OLAP -, Analytic functions.

# **UNIT – III BUSINESS FORECASTING**

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models - Data Mining and Predictive Analysis Modeling - Machine Learning for Predictive analytics.

# UNIT - IV HR & SUPPLY CHAIN ANALYTICS

Human Resources - Planning and Recruitment - Training and Development - Supply chain network -Planning Demand, Inventory and Supply - Logistics - Analytics applications in HR & Supply Chain.

# UNIT - V MARKETING & SALES ANALYTICS

Marketing Strategy, Marketing Mix, Customer Behavior - selling Process - Sales Planning - Analytics applications in Marketing and Sales.

Total: 45 Periods

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#### **Text Books:**

- 1. R. Evans James, "Business Analytics: methods, models and decisions", Pearson, 1st edition, 2017.
- 2. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley, 2nd edition, 2016.
- 3. Philip Kotler and Kevin Keller, "Marketing Management", Pearson, 15th edition, 2016.

#### **Reference Books:**

- 1. Mahadevan B, "Operations Management -Theory and Practice", Pearson Education, 3rd Edition, 2018.
- 2. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", Pearson, 9th Edition, 2013.
- 3. VSP RAO, "Human Resource Management", Excel Books, 3rd Edition, 2010.

#### **Additional References:**

- 1. https://nptel.ac.in/courses/110/105/110105089/
- 2. https://nptel.ac.in/courses/110/107/110107092/
- 3. https://nptel.ac.in/courses/110/107/110107129/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific **Outcomes (PSOs)** POs **PSOs** COs 6 7 8 9 4 2 3 Δ 5 10 11 12 1 2 2

		-			•	•	v	U U	10		1.64		-	
CO1	3	3	3	3	3						3	3	3	3
CO2	3	3	3	3	3						3	3	3	3
CO3	3	3	3	3	3		a.2				3	3	3	3
CO4	3	3	3	3	3			1			3	3	3	3
CO5	3	3	3	3	3				-		3	3	3	3
	3		Hi	gh		2	Med	lium		1		Lo	N	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Apply	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
_	Attendance	5	

· · · · · · · · · · · · · · · · · · ·	Summ	ative Assessme	nt	
	Continu	nt Tests	Final	
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	20	40
Apply	20	20	20	50
Evaluate	0	0	0	0
Create	0	0	0	0

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20CSE05	COMPUTER VISION AND APPLICATIONS	L	Τ	Ρ	С
			0	0	2
Nature of Course	Professional Elective			U	5
Pre requisites	Computer Graphics and Multimedia	-	_		_

#### **Course Objectives**

The course is intended to

- 1. Review image processing techniques for computer vision.
- 2. Understand various features and recognition techniques.
- 3. Understand Hough Transform and its applications to detect lines, circles, ellipses.
- 4. Study three-dimensional image analysis techniques.
- 5. Create the real world applications of computer vision algorithms.

#### Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's
CO1	Understand Low level processing of image and transformation techniques	Understand
CO2	Identify the feature extraction, segmentation and object recognition methods.	Understand
CO3	Apply Hough Transform for line, circle, and ellipse detections.	Apply
CO4	Illustrate 3D vision process and motion estimation techniques.	Analyze
CO5	Write the vision techniques to real time applications.	Create

#### Course Contents:

#### UNIT - I INTRODUCTION

Image Processing, Computer Vision , What is Computer Vision - Low-level, Mid-level, High-level ; Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

#### UNIT - II FEATURE EXTRACTION AND FEATURE SEGMENTATION

Feature Extraction -Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space 69 Analysis-Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Image Segmentation -Region Growing, Edge Based approaches to segmentation.

#### UNIT-III HOUGH TRANSFORM

Line detection - Hough Transform (HT) for line detection - foot-of-normal method - line localization line fitting - RANSAC for straight line detection - HT based circular object detection - accurate center location - speed problem - ellipse detection - Case study: Human Iris location - hole detection generalized Hough Transform (GHT).

#### UNIT - IV **3D VISION AND MOTION**

Methods for 3D vision - projection schemes - shape from shading - photometric stereo - shape from texture - shape from focus - active range finding - surface representations - point-based representation - volumetric representations - 3D object recognition - 3D reconstruction - introduction to motion - triangulation - bundle adjustment - translational alignment - parametric motion-splinebased motion- optical flow - layered motion.

#### UNIT-V

Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data

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#### **Q**

Processing, Virtual Reality and Augmented Reality,

#### Text Books:

#### Total: 45 periods

- 1. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, Second Edition2015.
- 2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited, 2011.

#### **Reference Books:**

- 1. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Fourth Edition, Academic Press, 2019.
- 2. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.
- 3. D. L. Baggio et al., —"Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.

#### Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc21\_ee23/preview
- 2. https://nptel.ac.in/courses/106/105/106105216/
- 3. https://onlinecourses.nptel.ac.in/noc19\_cs58/preview

Мар	ping	of Cou	irse Ou	itcome	es (CO	) with ( Oເ	Progra utcome	imme ( es (PS(	Outcor O)	nes (P	O) and	l Progr	amme	Speci	fic
COs						P	Os						F	SOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2		3	3	2		3	3	2	2	3	3	
CO2	3	3	2		3	2	2		3	3	2	2	3	3	
CO3	3	3	2		3				3	3	2		3	2	
CO4	3	3	2	2	3				3	3			3	3	
CO5	3	3	3	2	3				3	3	2		3	3	
	3		High			2		Vediun	n	1.00	1		Low		-

Formative assessment									
Bloom's Level	Assessment Component	Marks	Total						
Remember	Online Quiz		IIIdrks						
Understand	Tutorial Class / Assignment	5	15						
	Attendance	5	- 13						

	Su	Immative Asse	ssment	
Bloom's Category	Internal A	ssessment Exa	Terminal Examination	
	IAE - I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	20
Analyze			00	60
Evaluate				
Create				

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022

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20CSE06	20CSE06 OPTIMIZATION TECHNIQUES	L	T	Ρ	С
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	NIL				

#### Course Objectives

The course is intended to

- 1. Formulate and solve linear programming problems.
- 2. Able to understand different types of Classical Optimization techniques.
- 3. Evaluate Transportation and Assignment Problems.
- 4. Explain about Decision making under uncertainty and certainty conditions,
- 5. Create various Queuing models

### Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's
CO1	Learn to apply simplex algorithm for LPP	Level
CO2	Understand the overview of optimization techniques	Understand
CO3	Able to Build and solve real-life transportation, assignment and travelling salesman problems.	Apply
CO4	Able to handle issues in Decision Making Under various conditions	Analyza
CO5	Prepare the queuing models for day to day problems	Create

## **Course Contents:**

#### UNIT - I LINEAR PROGRAMMING

Various definitions, statements of basic theorems and properties, Advantages, Limitations and Application areas of Linear Programming, Graphical method of Linear Programming problem. Simplex Method-Phase I and Phase II of the Simplex Method, The Revised Simplex method, Primal and Dual Simplex Method, Big -M method.

#### UNIT - II INTRODUCTION TO CLASSICAL OPTIMIZATION TECHNIQUES

Single variable Optimization, Multi variable Optimization with and without constraints, Multivariable Optimization with equality constraints - solution by method of Lagrange multipliers, Multivariable Optimization with inequality constraints - Kuhn - Tucker conditions.

#### UNIT-III TRANSPORTATION PROBLEM

Northwest corner rule, Least cost method, Vogel's approximation method - stepping stone method -MODI method - Unbalanced transportation - Assignment problem - Hungarian algorithm - Travelling salesman problem - project management.

#### UNIT – IV **DECISION AND GAME THEORY**

Decision making under certainty - Decision making under risk - Decision making under uncertainty -Decision tree analysis -Introduction to MCDM; AHP. Game Theory - Two person zero sum games, pure and mixed strategies - Theory of dominance - Graphical Solution - Solving by LP.

#### UNIT – V QUEUING MODELS

9 Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

Total: 45 periods

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#### Text Books:

- 1. Hamdy A Taha, "Operations Research: An Introduction", Pearson, 10th Edition, 2017.
- 2. Philips, Ravindran and Solberg, "Operations Research principles and practices", John Wiley, 2007.

### **Reference Books:**

- 1. Ronald L Rardin, "Optimisation in Operations Research", Pearson, 2018.
- 2. Srinivasan.. G, "Operations Research Principles and Applications", PHI, 2017.
- 3. ND Vohra, "Quantitative Techniques in Management", Tata McGraw Hill, 4th Edition, 2011.

#### Additional References:

- 1. https://nptel.ac.in/courses/106/108/106108056/
- 2. https://nptel.ac.in/courses/111/104/111104071/
- 3. https://www.youtube.com/watch?v=4s3Ks-yNufc

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

						~			<i>~i</i>						
COs		POs										PSOs			
-	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1					2			2	3	1	
CO2	3	2	2		2				2				3	1	
CO3	3	3	3	3					3	2		2	3	1	
CO4	3	2	1	3		-		2	2	2			3	1	
CO5	3	2	2	1	2		2					3	3	1	
	3		High			2		Mediur	n		1		Low		

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

	Sı	Immative Asse	ssment	
Bloom's Category	Internal A	ssessment Exa	Terminal Examination	
Bloom s category	IAE – I (7.5)	IAE – II (7.5)	IAE – III (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

Passed in Board of studies Meeting 25.02.2022



Approved in Academic Council Meeting 09.03.2022

20CSE07	COMPUTATIONAL INTELLIGENCE	L	Т	Ρ	С
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Data Structures and Algorithm				

# **Course Objectives**

The course is intended to

- 1. State the aware of soft computing methods and their roles.
- 2. Classify the knowledge in solving AI problems.
- 3. Exploit fuzzy principles to deal with liability.
- 4. Make use of various supervised, semi-supervised and unsupervised learning algorithms in
- 5. Be familiar with the various applications of Artificial intelligence.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Recognize and depict soft computing methods and their roles to build intelligent systems	Remember
CO2	Represent a problem using first order and predicate logic	Understeed
CO3	Apply fuzzy principles and thinking to deal with vulnerability and tackle real- time issues.	Apply
CO4	Analyze and suggest appropriate machine learning approaches for various types of problems	Analyze
CO5	Design applications for NLP that use Artificial Intelligence	Create

#### Course Contents:

# Unit - I INTRODUCTION

Introduction to CI, History of CI, Basic techniques and applications of CI, Introduction to Neural Network, Fuzzy Logic, Genetic Algorithm, Hybrid System.

# Unit- II KNOWLEDGE REPRESENTATION AND REASONING

First Order Predicate Logic - Unification - Resolution - Knowledge Representation - Ontological Engineering - Categories and Objects -Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming.

# Unit - III UNCERTAINTY

Non Monotonic Reasoning - Fuzzy Logic -Fuzzy rules - fuzzy inference - Temporal Logic - Temporal Reasoning - Neural Networks - Neuro - fuzzy Inference.

## Unit - IV LEARNING

Probability basics - Bayes Rule and its Applications - Bayesian Networks - Hidden Markov Models -Forms of Learning - Supervised Learning - Learning Decision Trees -Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm - Reinforcement Learning.

## Unit-V INTELLIGENCE

Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis- Language Models - Information Retrieval - Information Extraction - Machine Translation - Machine Learning: Connectionist - Symbol-Based.

Total: 45 Periods

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#### Text Books:

- 1. R. Kruse, C. Borgelt, C. Braune, "Computational Intelligence: A Methodical Introduction", 2nd Edition, Springer, 2016.
- 2. S. Marsland, "Machine Learning", CRC Press, 2015.

#### Reference Books:

- 1. M. Negnevitsky, Artificial Intelligence, "A Guide to Intelligent Systems", Pearson Publishing, 2006.
- 2. J. Jang, C. Sun, and E. Mizutani, "Neuro Fuzzy and Soft Computing", Prentice Hall Publishing, 1997.
- 3. C. T. Lin and C.S. Lee, "Neural Fuzzy Systems", Prentice Hall Publishing, 1995.

#### **Additional References:**

- 1. https://onlinecourses.nptel.ac.in/noc22\_cs56/preview
- 2. https://nptel.ac.in/courses/106/106/106106202/
- 3. https://nptel.ac.in/courses/106/102/106102220/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

							0 0 0 0 0	100 (								
Coo	Pos												PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	-	-		i e	-		-	-		-	3		2	-	
CO2	3	3		7		-	-	æ.,	-	-	3 <b>9</b> 6	3		-	1.2	
CO3	3	3	3	12	- 4	-	(4) (4)	(a)		-	-	3	3	2	3	
CO4	3	3	-		-	-	( <del>)</del> ):	-	-	-	-	3	3	2	1244	
CO5	3		-	-	-	-		- <del>3</del> , 1	-	-		3	3	2	2	
	3	High				2	Mediu	im		1.0		1	Low			

Formative assessment								
Bloom's Level	Assessment Component	Marks	Total marks					
Remember	Online Quiz	5						
Understand	Tutorial Class / Assignment	5	15					
	Attendance	5						

	Summ	native Assessme	ent	- Contrainty - Contrainty
Bloom's Category	Intern	Final Examination		
Bioom's category	IAE I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	10	20	30
Analyze		20	10	30
Evaluate			10	
Create				

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20CSE08	AUGMENTED REALITY & VIRTUAL REALITY	L	Τ	Ρ	С
		0	0	3	
Nature of Course	Professional Elective		L		
Pre requisites	Computer Networks				

### **Course Objectives**

The course is intended to

- 1. Learn the basic concepts of Virtual reality
- 2. Learn the methods of mobile telecommunication system.
- 3. Familiar with the mobile network and transport layers
- 4. Explore in the field of mobile Adhoc wireless networks.
- 5. Gain knowledge about different mobile platforms and application development

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level						
CO1.	Understand fundamental computer vision, computer graphics and human-computer interaction techniques related to VR/AR	Understand						
CO2.	02. Understand Computer graphics and geometric modeling							
CO3.	Learn about virtual environment	Apply						
CO4.	To relate and differentiate VR/AR technology	Apply						
CO5.	To use various types of Hardware and software in virtual Reality systems	Apply						

#### **Course Contents:**

# Unit -I INTRODUCTION TO VIRTUAL REALITY

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

# Unit - II COMPUTER GRAPHICS AND GEOMETRIC MODELING

Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modeling, 3D clipping, Illumination models, Reflection models. Shading algorithms. Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

#### Unit - III VIRTUAL ENVIRONMENT

Input: Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. Output: Visual /Auditory / Haptic Devices. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems. Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system

#### Unit - IV AUGMENTED REALITY

Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

#### Unit - V DEVELOPMENT TOOLS AND FRAMEWORKS

Human factors: Introduction, the eye, the ear, the somatic senses. Hardware: Introduction, sensor

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Total: 45 Periods

hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML.

#### Text Books:

- 1. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley 2016.
- 2. Alan B. Craig, "Understanding Augmented Reality, Concepts and Applications", Morgan Kaufmann, 2013.

#### **Reference Books:**

- 1. Alan Craig, William Sherman and Jeffrey Will, "Developing Virtual Reality Applications, Foundations of Effective Design", Morgan Kaufmann, 2009.
- 2. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007.
- 3. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi 2007.

#### **Additional References:**

- 1. https://www.digimat.in/nptel/courses/video/106105195/L13.html
- 2. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ge08/
- 3. https://nptel.ac.in/courses/121/106/121106013/

Марр	ing of	Cours	e Out	comes	(COs	) with Outc	Progra	amme (PSOs	Outco )	mes (F	POs) P	rogran	nme S	pecifi	С
COs			PSOs												
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	
CO2	3	2	2	1									3	1	
CO3	3	2	1	1									3	1	
CO4	3	3	2	1						Contraction of			3	1	1
CO5	3	3	2	2				-					3	1	
	3 High 2 Medium 1											Lov	N	1	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Apply	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
	Attendance	5	

	Summ	ative Assessme	nt			
	Continu	Final				
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination (60)		
Remember	10	10	10	10		
Understand	20	20	20	40		
Apply	20	20	20	50		
Evaluate	0	0	0	0		
Create	0	0	0	0		

Passed in Board of studies Meeting 25.02.2022

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Approved in Academic Council Meeting 09.03.2022

20CSE09	NATURAL LANGUAGE PROCESSING		Т	P	Te
Nature of Course	Professional Electivo	3	0	0	2
Prerequisites	Nil				

# **Course Objectives**

The course is intended to

- 1. Learn the fundamentals of natural language processing.
- 2. Understand the use of CFG and PCFG in NLP.
- 3. Understand the role of semantics of sentences and pragmatics. 4. Apply the NLP techniques to IR applications
- 5. Compare the statistical approaches for different types of NLP applications.

# **Course Outcomes**

On successful completion of the course, students will be able to CO No

CO. NO.	Courses Outer	and the second
CO1.	Understand a given text with basic Learning (	Bloom's Level
CO2.	Solve an innovative application using NLP components	Understand
CO3.	Implement a rule based system to tackle morphology/syntax of a least	Apply
CO4.	Categorize the set of statistical processing for real-time applications	Apply
COF	Compare and contrast the use of different statistical	Analyze
	different types of NLP applications.	Analyze

### **Course Contents:**

# UNIT - I INTRODUCTION OF NATURAL LANGUAGE PROCESSING

Origins and challenges of NLP - Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata - English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

# UNIT - II WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff - Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging - Hidden Markov and Maximum Entropy models.

# UNIT - III SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar -Syntactic Parsing, Ambiguity, Dynamic Programming parsing - Shallow parsing - Probabilistic CFG and CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

# UNIT - IV SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics - Syntax-Driven Semantic analysis and attachments - selectional restrictions - Word Sense Disambiguation, WSD using Supervised, Bootstrapping methods - Word Similarity using Thesaurus and Distributional methods.

# UNIT - V DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation, Coherence - Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm - Coherence Resolution - Resources: Penn Treebank, Brill's Tagger, Word Net, Brown Corpus, British National Corpus (BNC).

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#### **Total: 45 Periods**

#### **Text Books:**

- 1. Daniel Jurafsky, James H. Martin "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
- 2. James Allen. "Natural Language Understanding", Addison Wesley, 1994.

#### **Reference Books:**

- 1. Breck Baldwin, "Language processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015.
- 2. Richard M Reese, "Natural Language Processing with Javall", O\_Reilly Media, 2015.
- 3. Nitin Indurkhya and Fred J. Damerau, "Handbook of Natural Language Processing", Second Edition, Chapman and Hall/CRC Press, 2010.

#### Additional References:

- 1. https://nptel.ac.in/courses/111/103/111103016/
- 2. https://nptel.ac.in/courses/106/106/106106049/
- 3. https://www.digimat.in/nptel/courses/video/111103016/L01.html

Марр	ing of	Cours	se Out	tcome	es (CC	Ds) wit Ou	h Prog tcome	gramm s (PS	ne Out Os)	comes	(POs)	Progra	mme	Speci	fic			
Cos	Pos														PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
CO1	3	3	3										3	3	2			
CO2	3	3	3										3	3	2			
CO3	3	3	3	<u></u>									3	3	2			
CO4	3	3	3									_	3	3	2			
CO5	3	3	3			191							3	3	2			
	3		Hię	gh		2		Medium 1				1	Low					

Formative assessment										
Bloom's Level	Assessment Component	Marks	Total marks							
Remember	Online Quiz	5								
Understand	Tutorial Class / Assignment	5	15							
	Attendance	5								

	Su	immative Asse	ssment			
Bloom's Category	Internal A	ssessment Exa	Terminal Examination			
Bloom s oategory	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)		
Remember	10	10	0	20		
Understand	20	20	10	20		
Apply	10	10	20	40		
Analyze	10	10	20	40		
Evaluate			20	20		
Create						

Passed in Board of studies Meeting 25.02.2022

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20CSE10	SOCIAL NETWORK ANALYSIS	L	Т	P	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	NIL				

# **Course Objectives**

The course is intended to

- 1. Understand the components of the social network.
- 2. Model and visualize the social network.
- 3. Know human behavior in social web and related communities.
- 4. Identify the evolution of the social network.
- 5. Create the applications of social networks.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Explain about the internals components of the social networks	Level
CO2	Model and visualize the social network	Understand
CO3	Predict human behavior in social web and related communities	Apply
CO4	Explain about the evolution of social networks	Apply
CO5	Create the various social networks Applications	Analyze
	and the various social networks applications	Create

#### Course Contents:

### UNIT-I INTRODUCTION

Introduction to Web - Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Statistical Properties of Social Networks -Network analysis -Development of Social Network Analysis - Key concepts and measures in network analysis -Discussion networks - Blogs and online communities - Web-based networks.

# UNIT-II MODELING AND VISUALIZATION

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation -Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix- Based Representations - Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data - Random Walks and their Applications - Use of Hadoop and Map Reduce.

### UNIT-III MINING COMMUNITIES

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks -Evaluating Communities - Core Methods for Community Detection and Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

# UNIT-IV EVOLUTION OF SOCIAL NETWORKS

Evolution in Social Networks - Framework - Tracing Smoothly Evolving Communities -Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence -Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints- with Score Propagation - Expert Team Formation - Link Prediction in Social Networks.

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## UNIT-V APPLICATIONS OF SOCIAL NETWORK

Graph Theory – Centrality – Clustering – Node Edge Diagrams – Matrix Representation – Visualizing Online Social Networks – Co-Citation Networks. A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments – Explaining Scientific and Technical Emergence Forecasting – Social Network Analysis for Biometric Template Protection.

#### **Text Books:**

**Total: 45 Periods** 

9

- 1. Charu C.Aggarwal, "Social Network Data Analytics", Springer, United States, 2nd Edition, 2014.
- 2. Peter Mika, "Social Networks and the Semantic Web", Springer, United States, 1st Edition, 2007.

#### **Reference Books:**

- 1. Ajith Abraham, Aboul Ella Hassanien, vaclasnsel,"Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, United States, 3<sup>rd</sup> Edition, 2012.
- 2. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, United States, 1st Edition, 2011.
- 3. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, United States, 2010.

### Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc20\_cs78/preview
- 2. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-cs41/
- 3. https://www.digimat.in/nptel/courses/video/106106169/L01.html

Mapping	of Co	urse	Outc	ome	s (CC	)s) w C	/ith Pr	ograi nes (l	mme PSOs	Outo s)	come	s (PC	Ds) Prog	ramme \$	Specific
Cos		_		PSOs											
CUS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2													3
CO2	2	2			2				2	2	-		2	2	3
CO3	2	2			2				2	2					3
CO4	2	2							2	2			2	2	3
CO5	2	2			2				2	2			2	2	3
	3	High				2	Mediu	im				1	Low		

Formative assessment						
Bloom's Level	Assessment Component	Marks	Total			
Remember	Online Quiz	5	Indino			
Understand	Tutorial Class / Assignment	5	15			
	Attendance	5				

	Summ	native Assessme	ent	
Bloom's Category	Intern	al Assessment E	xaminations	Final Examination
= seem o outegory	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	20
Understand	30	30	30	
Apply	10	10	30	60
Analyze	10	10	10	20
Evaluate				
Create		· · · · · ·		

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# PROFESSIONAL ELECTIVES (PE)

# STREAM II CYBER SECURITY AND FORENSICS:

20CSE21	CYBER LAW AND FTHICS	L	Т	P	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	NIL				

### Course Objectives

The course is intended to

- 1. Understanding concepts related to cyber world and cyber law in general.
- 2. Develop competitive edge on various facets of cyber crimes.
- 3. Problems arising out of online transactions and provoke them to find solutions Intellectual property. Issues in the cyber space and the growth and development of the law.
- 4. Regulation of cyber space at national and international level.
- 5. Upholding ethical standards in cyber laws and intellectual property issues.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's
CO1	Understand Cyber laws	Understand
CO2	Describe Information Technology act	Understand
CO3	Interpreted knowledge about Cyber law and Related Legislation	Understand
CO4	Demonstrate Electronic business and legal issues	Understand
CO5	Interpret Cyber Ethics	Understand

#### **Course Contents:**

# UNIT I INTRODUCTION TO CYBER LAW

Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

# UNIT II INFORMATION TECHNOLOGY ACT

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

# UNIT III CYBER LAW AND RELATED LEGISLATION

9 Patent Law, Trademark Law, Copyright, Software - Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

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## UNIT IV ELECTRONIC BUSINESS AND LEGAL ISSUES

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

#### UNIT V CYBER ETHICS

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Total: 45 periods

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#### **Text Books:**

- Mark Grabrowser, Eric P.Robinson, "Cyber Law and Ethics Regulation of the Connected World", Routledge publication, 1<sup>st</sup> Edition july 13, 2021.
- 2. Kenneth C. Laudon, "E-Commerce: Business, Technology", Society publication, 2016.

#### **Reference Books:**

- 1. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
- Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback)", O Reilly Media, 2<sup>nd</sup> Edition 2006.
- 3. Thomas R. Peltier, "Information Security policies and procedures": A Practitioners Reference, Prentice Hall, 2nd Edition 2004.

#### Additional References:

- 1. https://onlinecourses.swayam2.ac.in/nou19\_cs08/preview
- 2. https://youtu.be/dX\_l1ugkp6l
- 3. https://youtu.be/ZFHCZt5VnMs

Марр	ing of	Cours	e Outo	comes	(COs)	) with   Outco	Progra	mme (PSOs	Outco )	mes (F	POs) P	rogran	nme S	pecifi	С
CO2	POs								F	SOs					
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	1
CO2	3	2	1	1									3	1	1
CO3	3	3	2	1									3	1	1
CO4	3	3	2	1									3	1	1
CO5	3	2	2	1									3	1	1
	3	-	Hi	gh	w.	2		Mec	lium		1		Lov	v	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

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Bloom's Category	Internal A	ssessment Exa	aminations	Torminal
Remember	IAE - I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Understand	0	0	0	(00)
Apoly	10	10	10	20
Analyzo	20	20	20	30
Evaluate	20	20	20	30
Create				20

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20CSE22	SE22     CYBER FORENSICS     L     T     P       3     0     0	С				
	OTBERT ORENSICS		3	0	0	3
Nature of Course	Professional Elective			1		
Pre requisites	NIL	2				

#### **Course Objectives**

The course is intended to

- 1. Describe the general concept of computer forensics
- 2. State the evidence collection and Forensics tools

3. Analyze and validate the forensics data

4. Demonstrate the ethical hacking to identify the vulnerabilities and malware threats.

5. Describe the real world ethical hacking and web applications.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the basics of computer forensics	Understand
CO2	Apply a number of different computer forensic tools to a given scenario	Apply
CO3	Analyze and validate forensics data	Analyze
CO4	Evaluate the vulnerabilities in a given network infrastructure	Evaluate
CO5	Create the real-world hacking techniques to test system security	Create

#### Course Contents:

#### UNIT I INTRODUCTION TO COMPUTER FORENSICS

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation - Data Acquisition.

## UNIT II EVIDENCE COLLECTION AND FORENSICS TOOLS

Processing Crime and Incident Scenes - Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

# UNIT III ANALYSIS AND VALIDATION

Validating Forensics Data - Data Hiding Techniques - Performing Remote Acquisition - Network Forensics - Email Investigations - Cell Phone and Mobile Devices Forensics.

### UNIT IV ETHICAL HACKING

9 Introduction to Ethical Hacking - Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing.

# UNIT V ETHICAL HACKING IN WEB

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications - SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms-Future Issues.

Total: 45 periods

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#### Text Books

- 1. Black Hex Paperback, "Digital Forensic Engineering", Digital Forensic Press publication, 2<sup>nd</sup> Edition 2021.
- 2. Dejey, Murugan (IPS), "Cyber Forensics", Oxford University Press publication, 2018.

#### Reference Books:

- 1. MarjieT.Britz, "Computer Forensics and Cyber Crime an Introduction", 3rd Edition, Prentice Hall, 2013.
- 2. AnkitFadia,"Ethical Hacking", publication Macmillan India Ltd, 2nd Edition 2006.
- 3. John R.Vacca, "Computer Forensics", Cengage Learning publication, 2005.

#### Additional References:

- 1. https://onlinecourses.swayam2.ac.in/cec21\_ge10/preview
- 2. https://youtu.be/vMyRjm4KEXs
- 3. https://youtu.be/gDzr9vcRNBg

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

COs		POs								-	PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	1
CO2	3	2	1	1						1			3	1	
CO3	3	3	2	1						1		-	3	1	1
CO4	3	3	2	1						1			3	1	$\frac{1}{1}$
CO5	3	2	2	1				1.1		-		1.1.1.1	3	1	$\frac{1}{1}$
	3		High			2		l Mediun	n		1		Low		

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz	5	marks
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

Summative Assessment								
Bloom's Category	Internal A	ssessment Exa	aminations	Terminal Examination				
bloom a category	IAE - I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)				
Remember	0	0	0	0				
Understand	10	10	10	20				
Apply	20	20	20	30				
Analyze	20	20	20	30				
Evaluate				20				
Create	6	1						

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20CSE23	ETHICAL HACKING FUNDAMENTALS	L	Τ	Ρ	С
	ETHICAE HACKING FUNDAMENTAES	3	3 0		
Nature of Course	Professional Elective				
Pre requisites	Nil				

#### **Course Objectives**

The course is intended to

- 1. Plan a vulnerability assessment and penetration test for a network.
- 2. Execute a penetration test using standard hacking tools in an ethical manner.
- 3. Report on the strengths and vulnerabilities of the tested network.
- 4. Identify legal and ethical issues related to vulnerability and penetration testing
- 5. Implement penetration testing for malwares

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the concept of Ethical Hacking and Cryptographic techniques.	Understand
CO2	Identify the techniques of combinatorial analysis.	Analyze
CO3	Analyze the packets and able to find the intruders.	Analyze
CO4	Summarize the Vulnerabilities in a web application and servers	Evaluate
CO5	Invent the Pentest tools.	Create

#### **Course Contents:**

#### UNIT – I ETHICAL HACKING BASICS

Introduction to Ethical Hacking –Types of hacking –Phases of Ethical hacking. Cryptography: Cryptography and encryption – PKI, Digital certificates and digital signature – Encrypted communication and Cryptography attacks.

#### **UNIT-II RECONNAISSANCE AND SCANNING**

Foot printing: Foot printing with DNS – Determining Network Range. Scanning for targets: Identify Active machines – Port Scanning. Enumeration: Windows Security basics – Enumeration Techniques.

### UNIT - III SYSTEM ATTACK

System Attack: Windows system hacking – Password Cracking – Exploiting privileges. Social Engineering: Human Based attack – Computer based attack.

# UNIT - IV WEB BASED AND WIRELESS HACKING

Physical Security. Web Server Hacking: Web service architecture –Web attacks. Web Applications: Web applications attack – Web resources protection. Wireless Attacks – Bluetooth attacks.

# UNIT-V MALWARES AND PENETRATION TESTING

Malware Attacks: Trojans, viruses and worms. Penetration Testing: Types of Penetration testing – Penetration testing methodologies – Penetration test tools.

Total periods: 45

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## Text Books:

- 1. Matt Walker, "CEH- Certified Ethical Hackers Guide", McGraw-Hill Education, 4th Edition 2019. 2. Michael Gregg, "Certified Ethical Hacker (CEH) Version 9 Cert Guide", Pearson Education, 2nd

# **Reference Books:**

- 1. Parteek Sharma, "Hacking Reveale", White Falcon Publishing, 1stEdition, 2018.
- 2. Reginald Wong, "Mastering Reverse Engineering: Re-engineer your ethical hacking skills",
- 3. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Elsevier, 2nd Edition, 2013.

# Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc22\_cs13/preview
- 2. https://nptel.ac.in/courses/106/105/106105217/
- 3. https://nptel.ac.in/noc/courses/noc22/SEM1/noc22-cs13/

COs						F	Os	1. 0	-/					PSOn	
	1	2	3	4	5	6	7	8	9	10	11	12	4	-305	To
CO1	1	3	2	2	2	3	2			10		14	1	4	3
CO2	2	3	2	2	3	2	2				-	1	2	3	=
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000	-	2	2	2	3	3	1	× .	-	-	-	1	2	2	-
CO4	2	1	2	3	2	3	2				1000 (C)		2	2	
CO5	2	2	2	2	0	0	~			-	-	1	2	3	: 2 <b>4</b>
005	~	2	2	3	2	3	2		(元)	-	_	1	2	3	
	3		High			2	P	Aedium	1		1			0	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	5	
	Attendence	5	15
100 C 100 C 100	Allendance	5	

	Sun	mative Assessm	nent	
Bloom's Category	Intern	Final Examination		
	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	(00)
Understand	30	3()	20	20
Apply	10	10		60
Analyze	10	10	10	20
Evaluate				
Create				

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	SECURE	CI OUD COMPUTING	L	T	P	С
20CSE24	SECORE		3	3 0	0	3
Nature of Course	Professional Elective			-	-	
Pre requisites	NIL					

### **Course Objectives**

#### The course is intended to

- 1. Understand the different types of cloud models and services for building an efficient cloud Computing environment
- 2. Analyze the software security design principles
- Determine the cloud risk management issues and security policies.
- 4. Explore the cloud security architecture
- 5. Examine the lifecycle issues of cloud computing.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the concepts of cloud computing techniques.	Understand
CO2	Identify the fundamental security techniques.	Analyze
CO3	Analyze the risks involved in cloud computing.	Analyze
CO4	Evaluate the cloud architecture	Evaluate
CO5	Organize the cloud computing life cycle issues	Create

#### **Course Contents:**

### **UNIT - I CLOUD COMPUTING FUNDAMENTALS**

Cloud Computing- Essential Characteristics- Cloud Delivery Models- Cloud Deployment Models- -Service Models-Essential Characteristics of Cloud Computing-Benefits of Cloud Computing-

## UNIT-II CLOUD COMPUTING SOFTWARE SECURITY FUNDAMENTALS

Cloud Security Services - Cloud Security Design Principles- Secure Cloud Software Requirements-Secure Development Practices- Secure Cloud Software Testing- Cloud Penetration Testing

#### **UNIT- III CLOUD RISK MANAGEMENT**

Cloud Computing Risk Issues: The CIA Triad-Threats to Infrastructure, Data and Access Control-Cloud Service Provider Risks-Cloud Computing Security Challenges: Security Policy Implementation-Virtualization Security Management.

# UNIT - IV CLOUD COMPUTING SECURITY ARCHITECTURE

Information classification -Trusted Cloud Computing - Identity Management and Access Control Access control- Autonomic Security- Cloud Computing and Business Continuity Planning/Disaster Recovery.

# UNIT-V CLOUD COMPUTING LIFE CYCLE ISSUES

Cloud security standards: - Layered Security and IDS - Intrusion Detection and issues- Security 9 Incident Notification Process - Encryption and Key Management- Hardware Protection- Software-Based Protection- VM Life Cycle.

**Total periods: 45** 

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# **Text Books:**

- 1. Ronald L. Krutz, Russell Dean Vines "Cloud Security "A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing Inc,2010
- Tim Mather, Subra Kumaraswamy, and Shahed Latif oreilly "Cloud Security and Privacy" First 2.

# **Reference Books:**

- 1. Lawrence Miller, "Cloud Security & Compliance Palo Alto Networks" John Wiley & Sons, 2019.
- 2. Zeal Vora"Enterprise Cloud Security and Governance", Packt Publishing Ltd Dec, 2017. 3. Frank Kim, Rob Lee, John Pescatore "Practical Guide to Security in the AWS cloud", Sans Publishers, second edition 2014.

# Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105167/
- 2. https://nptel.ac.in/noc/courses/noc21/SEM2/noc21-cs62/
- 3. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs20/

Cos		1				P	os							PSOs	ls		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	2		
CO1	1	3	2	2	2	3	2	-	-		- 1	1	2	2			
CO2	2	3	2	2	1	3	1	-	-			1		3			
CO3	2	2	2	1	1	3	2							2	-		
CO4	2	1	2	3	2	2	2	-		-	-	1	2	2			
	-		<u> </u>	5		3	2			-	-	1	2	3	-		

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	5	_
	Attendance	5	15
	Richard	5	

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
	IAE - I (7.5)	IAE II (7.5)	IAE - III(10)	(60)
Remember	10	10	10	
Understand	30	30	10	20
Apply	10		30	60
Analyze	10	10	10	20
Evaluate			and the second	
Create				

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20CSE25	INFORMATION SECURITY	L	Т	P	С	
2003123		3	3 0			
Nature of Course	Professional Elective					
Pre requisites	Cryptography and Network Security					

#### **Course Objectives**

The course is intended to

- 1. Understand the basics of Information Security.
- 2. Know the legal, ethical and professional issues in Information Security.
- 3. Know the aspects of risk management.
- 4. Know the aspects of e-mail privacy.
- 5. Know the technological aspects of Information Security.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Understand the basics of information security	Understand
CO2	Illustrate the legal, ethical and professional issues in information security	Apply
CO3	Demonstrate the aspects of risk management.	Apply
CO4	Analyze the different techniques in the e-mail privacy.	Analyze
CO5	Identify technological aspects of information security.	Analyze

#### Course Contents:

### UNIT - I INTRODUCTION

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption algorithms, The Data Encryption Standard, The AES Encryption Algorithms, Public Key Encryptions, Uses of Encryption.

#### UNIT - II SECURITY INVESTIGATION

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues -An Overview of Computer Security – Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

#### UNIT- III SECURITY ANALYSIS

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk -Systems: Access Control Mechanisms, Information Flow and Confinement Problem

### UNIT - IV EMAIL PRIVACY

Pretty good privacy (pgp) and s/mime, PGP Notations, PGP Operation- Authentication, PGP Operation-Confidentiality, PGP Operation – Email Compatibility, PGP Operation – Segmentation/ Reassembly, Cryptographic Keys and Key Rings.

## UNIT – V PHYSICAL DESIGN

9 Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.

Total: 45 periods

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#### Text Books:

- 1. SanilNadkarni, "Fundamentals of Information Security: A Complete Go-to Guide for Beginners to Understand All the Aspects of Information Security" BPB Publication, November 2020.
- 2. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.

#### **Reference Books:**

- 1. Micki Krause, Harold F. Tipton,"Handbook of Information Security Management", Vol 1-3 CRCPress LLC, 2004.
- 2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003.
- 3. Matt Bishop, Computer Security Art and Science, Pearson/PHI, 2002.

## Additional References:

- 1. https:// nptel.ac.in/courses/106/106/106106129/
- 2. https:// nptel.ac.in/courses/106/106/106106141/
- 3. https://nptel.ac.in/courses/106/106/106106178/

COs						P	Os						PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	-
CO2	3	- 2	1	2		8				-			3	1	
CO3	3	_ 3	2	2									3	1	
CO4	3	3	2	2									3	1	
CO5	3	2	2	2									3	1	
	3		High			2		Mediun	n		1		Low		

Formative assessment									
Bloom's Level	Assessment Component	Marks	Total						
Remember	Online Quiz	5	marito						
Understand	Tutorial Class / Assignment	5	15						
	Attendance	5							

	Si	Immative Asse	ssment			
Bloom's Catagory	Internal A	ssessment Exa	aminations	Terminal Examination		
bloom s category	IAE – I (7.5)	IAE II (7.5)	IAE – III (10)	(60)		
Remember	0	0	0	0		
Understand	10	10	10	20		
Apply	20	20	20	30		
Analyze	20	20	20	30		
Evaluate				20		
Create						

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20CSE26		L	T	P	С	
	QUARTON ORTHOORAFIT	3	0	3		
Nature of Course	Professional Elective					
Pre requisites	Cryptography and Network Security					

#### **Course Objectives**

The course is intended to

- 1. Introduce the concepts of quantum cryptography.
- 2. Learn the basic concepts of quantum key distribution.
- 3. Provide the concepts of quantum key distribution tools.
- 4. Compare the various QKD protocols.
- 5. Create the attacks and future in QKD.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Identify the basic cryptography concept.	Remember
CO2	Understand basics of quantum Cryptography.	Understand
CO3	Identify tools and information of Quantum Cryptography.	Apply
CO4	Distinguish the properties of Quantum Key distribution protocols.	Analyze
CO5	Produce the security attacks and proofs	Create

#### **Course Contents:**

#### **UNIT-I OVERVIEW OF CRYPTOGRAPHY**

Basic Concepts of Cryptography – Types of Cryptographic Functions - Attacks on Cryptography - Cryptographic Techniques - Symmetric Crypto Algorithms (Shared or Secret Key Crypto) - Asymmetric Crypto Algorithms (Public Key Crypto) – Digital Signatures -Sniffing, Snooping, Spoofing

# UNIT -II INTRODUCTION TO QUANTUM CRYPTOGRAPHY

Introduction – Quantum Cryptography Fundamentals – Importance of Quantum Cryptography - Quantum Key Distribution – The Security of QKD – Quantum Secret Sharing – Post Quantum Cryptography.

# UNIT -III QUANTUM INFORMATION AND TOOLS

Introduction and overview on quantum information – classical bits vs quantum bits – Measuring quantum bits - Performing operations on qubits – Quantum tools density operator, tensor products of mixed states, partial trace, POVM.

## UNIT -IV QUANTUM KEY DISTRIBUTION

Quantum Key Exchange – Prepare and measure protocols - Entanglement based protocols – BB84 protocol – E91 protocol – Information reconciliation and privacy amplification – Challenges of QKD.

## UNIT -- V ATTACKS AND SECURITY PROOFS

Intercept and resend – Man-in-the-middle attack – The phase remapping attack - Photon number splitting attack – Denial of service - Trojan-horse attacks – Security proofs – Quantum Hacking – Future of QKD.

**Total: 45 Periods** 

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# **Text Books:**

1. Grasselli, Federico, "Quantum Cryptography: From Key Distribution to Conference Key Agreement (Quantum Science and Technology)", Springer; 1st ed. 2021 edition. 2. William Stallings., "Cryptography and Network Security", By Pearson, 7th Edition, 2017.

# **Reference Books:**

- 1. Ramona Wolf., "Quantum Key Distribution", Springer, 2021.
- 2. Gilbert, Michael, Yaakov S Weinstein, "Quantum Cryptography", World Scientific Publishing Co
- 3. Forouzan "Cryptography And Network Security", Mc Graw Hill India, 3Rd Edition 2015.

# Additional References:

- 1. https://nptel.ac.in/courses/115/101/115101092/https://youtu.be/7WSe4QA8Gts
- 2. https://nptel.ac.in/courses/106/106/106106232/
- 3. https://onlinecourses.nptel.ac.in/noc21\_cs103/preview

Cos						P	os			-1					
003	1	2	3	4	5	6	7	8	0	1101	44	10	-	PSOs	
CO1	3	2	2	-	1			0	3	10	- 11	12	1	2	3
CO2	3	3	2						-	-		1	2	•	-
CO3	3	2	2		2					-	-	1	3	-	-
CO4	2	1	1		2				-	-	-	1	1	-	_
005	2	-							19	2		1	1		-

	Formative assessment									
Bloom's Level	Assessment Component	Marks	Total							
Remember	Online Quiz		marks							
Understand	Tutorial Class / Assignment	5								
	Attendance	5	15							
	Allendance	5	1							

Bloom's Category	Internal A	ssessment Exa	aminations	Terminal Examination
	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	0	0	0	(00)
Understand	10	10	10	0
Apply	20	20	10	20
Analyze	20	20	20	30
Evaluate	20	20	20	30
Create				20

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20CSE27	BLOCK CHAIN AND CRYPTO CURRENCY	L	Т	Ρ	С
2000121	TECHNOLOGIES	3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	NIL				_

#### **Course Objectives**

The course is intended to

- 1. Understand the mechanism of Block chain and Crypto currency
- 2. Acquire knowledge on the functionality of current implementation of block chain technology
- 3. Recognize the required cryptographic background
- 4. Explore the applications of Block chain to crypto currencies and understanding limitations of current Block chain.
- 5. Exposure towards recent research.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the fundamentals of Cryptography in Crypto currency	Understand
CO2	Gain knowledge about various operations associated with the life cycle of Block chain and Crypto currency	Understand
CO3	Deal with the methods for verification and validation of Bit coin transactions	Apply
CO4	Demonstrate the general ecosystem of several Crypto currency	Apply
CO5	Educate the principles, practices and policies associated Bit coin business	Apply

#### **Course Contents:**

#### UNIT I INTRODUCTION TO CRYPTOGRAPHY AND CRYPTOCURRENCIES

Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency. Decentralization-Centralization vs. Decentralization-Distributed consensus, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

### UNIT II MECHANICS AND MINING OF BITCOIN

Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements, The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies.

# UNIT III BITCOIN AND ANONYMITY

Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash.

# UNIT IV COMMUNITY, POLITICS, AND REGULATION

Consensus in Bitcoin, Bitcoin Core Software, Stakeholders: Who's in Charge, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation, New York's Bit License Proposal. Bitcoin as a Platform: Bitcoin as an Append only Log, Bitcoins as Smart Property, Secure Multi Party Lotteries in Bitcoin, Bitcoin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds.

Passed in Board of studies Meeting 25.02.2022

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Approved in Academic Council Meeting 09.03.2022

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# UNIT V ALTCOINS AND THE CRYPTOCURRENCY ECOSYSTEM

Altcoins: History and Motivation, A Few Altcoins in Detail, Relationship Between Bitcoin and Altcoins, Merge Mining-Atomic Crosschain Swaps-6 Bitcoin Backed Altcoins, Side Chains, Ethereum and Smart Contracts.

### Text Books:

#### Total: 45 Periods

- 1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. "Bitcoin and crypto currency technologies: a comprehensive introduction", Princeton University Press 2016.
- 2. Antonopoulos, A. M., "Mastering Bitcoin: unlocking digital crypto currencies", OReilly Media, Inc., 2014.

#### Reference Books:

1. Franco, P." Understanding Bit coin: Cryptography, engineering and economics", John Wiley and Sons 2014.

#### Additional References:

- 1. https://nptel.ac.in/courses/106/104/106104220/
- 2. https://nptel.ac.in/courses/106/105/106105184/
- 3. https://onlinecourses.nptel.ac.in/noc19\_cs63/preview

Mapping	of Co	ourse	Outo	come	s (Co	Ds) v C	vith Pı Dutcor	rogra nes (	mme PSO	e Outo s)	come	s (PC	s) Prog	ramme S	Specif
Cos						E	Pos						PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2		2							2	2	1	1
CO2	3	2	2		2							2	3	3	3
CO3	3	2	2		2							1	2	2	
CO4	3	3	3		1							1	3	3	3
CO5	3	3	3		2							2	3	3	- 3
	3	High	12.000			2	Mediu	m		-l l.,.		1	OW		1

Formative assessment								
Bloom's Level	Assessment Component	Marks	Total marks					
Remember	Online Quiz	5						
Understand	Tutorial Class / Assignment	5	15					
	Attendance	5	1 10					

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
Diooni o categoiy	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	15	15	10	20
Understand	20	15	20	30
Apply	15	20	20	30
Analyze	0	0	0	20
Evaluate	0	0	0	0
Create	0	0	0	0

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022



20CSE28	CYBER CRIME AND COMPLITER ETHICS	L	T	P	С
	OTBER GRIME AND COMPOTER ETHICS	3	0	0	3
Nature of Course	Professional Elective	h		-	
Pre requisites	Nil	2 7 W			

#### **Course Objectives**

The course is intended to

- 1. Learn the basic concepts related to cyber world and cyber crime in general
- 2. Describe the competitive edge on various facts of cyber crimes
- 3. Problems arising out of cyber terrorism and provoke them to find solutions Intellectual issues in the cyber crime and the growth and National Security awareness
- 4. Regulation of computer ethics at national and international level.
- 5. Upholding general ethical standard and security awareness.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Define the Cyber crime	Remember
CO2	Describe Investigating cyber crime	Understand
CO3	Interpreted knowledge about cyber terrorism	Understand
CO4	Demonstrate Computer Ethics	VlqqA
CO5	Categorize the Computer Ethics and Security	Analyze

#### **Course Contents:**

### UNIT I INTRODUCTION CYBER CRIME

Cyber Crimes and Cyber Laws- Introduction to IT laws & Cyber Crimes - Internet, Hacking, Cracking, Viruses, Virus Attacks, Pornography, Software Piracy, Intellectual property, Legal System of Information Technology, Social Engineering, Mail Bombs, Bug Exploits, and Cyber Security.

#### UNIT II INVESTIGATING CYBERCRIME

Digital Evidence and Computer Forensics, Interception, Search and Seizure, and Surveillance, Cyber Crime and Offences, Network Service Providers Liability.

# UNIT III INFORMATION ACT

Information Warfare, Cyber terrorism, and Hacktivism, Terrorism, Radicalization, and The War of Ideas, Trade Secret Theft and Economic Espionage, National Security.

# UNIT IV COMPUTER ETHICS

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

# UNIT V COMPUTER ETHICS AND SECURITY

9 Ethics, Legal Developments, Cyber security in Society, Security in computer ethics case studies, General security awareness and Cyber Law-a Swift Analysis.

Total: 45 periods

Passed in Board of studies Meeting 25.02.2022



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## Text Books:

- Mark Grabrowser, Eric P.Robinson, "Cyber Law and Ethics Regulation of the Connected World", Routledge publication, 1<sup>st</sup> Edition 2021.
  Matthew Richardson "Cyber Original States" or interview.
- Matthew Richardsaa, "Cyber Crime: Law and Practice Hardcover", Wildy, Simmonds and Hill publications, 2<sup>nd</sup> Edition November 2019.

# **Reference Books:**

- Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
- Jack Balkin, et al. eds, "CYBERCRIME: Digital Cops in a Networked World ", 1st Edition NYU Press 2007.
- Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback)", O Reilly Media, 2nd Edition 2006.

## Additional References:

- 1. https://onlinecourses.swayam2.ac.in/nou19\_cs08/preview
- 2. https://onlinecourses.swayam2.ac.in/cec22\_cs03/preview
- 3. https://youtu.be/GAXXQTuhaPk

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CO1	3	2	1	1								1 1	-	~	3
CO2	3	2	1	1	1.200						1		3	1	1
CO3	2	2				-						1.1	3	1	1
000	3	3	2										3	1	1
CO4	3	3	2	1		2						-	0	4	1
CO5	3	2	2	1									3	1	1
2	3											3	1	1	
	3	<u>3</u> High 2				2		Med	ium	1	1			A/	

•>	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	5	4
	Attendance	5	15
	Adendance	5	

	Su	Immative Asse	ssment	
Bloom's Category	Internal A	ssessment Exa	aminations	Terminal Examination
	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Remember	0	0	0	(00)
Understand	10	10	10	0
Apply	20	10	10	20
Apolyza	20	20	20	30
Analyze	20	20	20	30
⊏valuate				20
Create				20

Passed in Board of studies Meeting 25.02.2022

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Approved in Academic Council Meeting 09.03.2022

2008520		L	Т	Ρ	С
2003229	MODILE AFFLICATION SECONT	3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	Mobile Computing				

#### **Course Objectives**

The course is intended to

- 1. Learn the Mobile issues and development strategies.
- 2. Illustrate the WAP and Mobile security issues.
- 3. Discover the Bluetooth security issues.
- 4. Identify the SMS security issues.
- 5. Create the Enterprise security on Mobile OS.

#### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Basic Knowledge on Mobile Issues	Understand
CO2	Choose the security protocols	Apply
CO3	Discover the overview of Bluetooth Security	Apply
CO4	Identify various SMS Security	Analyze
CO5	Design the various Encryption Technologies	Create

#### **Course Contents:**

#### UNIT - I TOP MOBILE ISSUES AND DEVELOPMENT STRATEGIES:

Top Issues Facing Mobile Devices, Physical Security, Secure Data Storage (on Disk), Multiple-User Support with Security, Safe Browsing Environment, Information Disclosure, Virus, Worms, Trojans, Spyware and Malware.

#### UNIT - II WAP AND MOBILE HTML SECURITY:

WAP and Mobile HTML Basics, Authentication on WAP/Mobile HTML Sites, Encryption, Application Attacks on Mobile HTML Sites, Cross-Site Scripting, SQL Injection, Cross-Site Request Forgery, HTTP Redirects, Phishing.

#### UNIT – III BLUETOOTH SECURITY:

Overview of the Technology, Bluetooth Technical Architecture, Radio Operation and Frequency, Bluetooth Network Topology, Device Identification, Modes of Operation, Bluetooth Stack, Bluetooth Profiles, Bluetooth Security.

#### UNIT - IV SMS SECURITY:

Overview of Short Message Service, Wireless Application Protocol (WAP), Protocol Attacks, Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks, iPhone Safari, Windows Mobile MMS.

# UNIT - V ENTERPRISE SECURITY ON THE MOBILE OS:

Device Security Options, PIN, Remote, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, E-mail Encryption, File Encryption Buffer Overflow Protection, Windows Mobile, iPhone, Android, BlackBerry.

Total: 45 Periods

Passed in Board of studies Meeting 25.02.2022

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# **Text Books:**

- 1. Gerardus Blokdyk, "Mobile Application Security Testing", Kindle edition, 2018. 2. Himanshu Dwivedi, Chris Clark, David Thiel, "Mobile Application Security", TATA McGraw hill,

# **Reference Books:**

- 1. Pattnaik Prasant Kumar and Mall Rajib, "Fundamentals of Mobile Computing", Kindle edition
- 2. Sakthivel Rajendran, "Mobile Application Security with Opensource Tools", EMC Publications,
- 3. Giridhara Chitrapadi, "Mobile Application Security Testing", Mphasis Publications, 2010.

# Additional References:

- 1. nptel.ac.in/courses/106/106/106106156/
- 2. nptel.ac.in/courses/106/106/106106147/
- 3. nptel.ac.in/courses/106/106/106106222/

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<u>3 High</u> <u>3 1</u>		3	High	1		2	2	Med	1 lium			3	2	3	1	

100	Formative assessment		-
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz	and the second s	marks
Understand	Tutorial Class / Assignment	5	
	Attendence	5	15
	Auendance	5	

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
Remember	IAE - I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Understand	10	10	10	20
Apply	30	30	30	60
Analyze	10	10	10	20
Evaluate				
Create				

Passed in Board of studies Meeting 25.02.2022

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20CSE30	INTRUSION DETECTION AND PREVENTION	 L	Т	P	С
LUCOLOU	INTROSION DETECTION AND FREVENTION	3	0	0	3
Nature of Course	Professional Elective	-			
Pre requisites	Computer Networks	 1			

#### **Course Objectives**

The course is intended to

- 1. Understand the vulnerabilities and detection techniques of various attacks.
- 2. Understand the network intrusion detection & prevention mechanisms.
- 3. Expose the advanced detection method and prevention techniques.
- 4. Study the various architectures in IPS.
- 5. Explore Various Attacks using IDP tools.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level Understand	
CO1	Understand the physical location, the operational characteristics and the various functions performed by the intrusion detection and prevention system.		
CO2	Describe how components in different layers inter-operate in the intrusion detection and prevention system.	Understand	
CO3	Learn new techniques and to align new security technologies to existing network infrastructure.	Understand	
CO4	Understand the current and effective architecture to deal with network security threats.	Understand	
CO5	Apply intrusion detection alerts and logs to distinguish attack by using SNORT tool.	Apply	

#### **Course Contents:**

#### UNIT - I INTRODUCTION

History of Intrusion detection, Audit, Concept and definition, Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

#### UNIT - II INTRUSION DETECTION AND NETWORK TRAFFIC SIGNATURE

Components of IDS, Steps of implementation and monitoring, Host- and network-based IDS, Implementing and evaluating IDS, intrusion detection versus intrusion prevention, Signature analysis, Detecting traffic signatures, Identifying suspicious events, Creating custom traffic signatures, Common Vulnerability and Exposures (CVE) standards.

#### UNIT-III INTRUSION DETECTION AND PREVENTION TECHNIQUES

Host-based intrusion detection system (IDS) / intrusion prevention system (IPS), network based IDS/IPS. Data collection for IDS/IPS. Intrusion detection techniques, misuse detection: pattern matching, rule-based and state-based; anomaly detection: statistical based, machine learning based, data mining based; hybrid detection.

#### UNIT - IV IDS and IPS ARCHITECTURE

Tiered architectures, single-tiered, multi-tiered, peer-to-peer. Sensor: sensor functions, sensor deployment and security. Agents: agent functions, agent deployment and security. Manager component: manager functions, manager deployment and security. Information flow in IDS and IPS,

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## UNIT - V IDP TOOLS

9 Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.

#### Text Books:

Total: 45 periods

- 1. Ali A. Ghorbani, Network intrusion detection and prevention concepts and techniques, Springer, 2010.
- 2. C.Endorf, E. Schultz and J. Mellander, Intrusion Detection & Prevention, McGraw Hill/Oborne, 2004.
- 3. Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1<sup>st</sup> Edition, Prentice Hall, 2003.

#### Reference Books:

- 1. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
- Carl Endorf, Eugene Schultz and Jim Mellander "Intrusion Detection & Prevention", Tata McGraw-Hill 1st Edition, 2004.
- Stephen Northcutt, Judy Novak: "Network Intrusion Detection", New Riders Publishing, 3<sup>rd</sup> Edition 2002.

#### Additional References:

- 1. https://www.youtube.com/watch?v=RYB4cG8G2xo
- 2. https://nptel.ac.in/content/storage2/courses/downloads\_new/106106141/W1A1.pdf
- 3. https://www.youtube.com/watch?v=2YGUvopGkQc

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COs						F	os							PSOs	
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CO1	3	3	2		2	3	3		3	3	2	3			-
CO2	3	2	2	2	3	2	2		3	3	2	2			
CO3	3	2	2		2		-		3	3	2				
CO4	3	3	2	2	3				3	3					
CO5	3	3	3	2	3		-		3	3	2				
	3		High			2	1	Vediun	ו ו		1		Low		

	Formative assessment			
Bloom's Level	Assessment Component	Marks	Total	
Remember	Online Quiz	5	IIIarks	
Understand	Tutorial Class / Assignment	5	15	
	Attendance	5		

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Summative Assessment							
Pleam's Category	Internal A	ssessment Exa	Terminal Examination				
BIOOM'S Category	IAE – I (7.5)	IAE – II (7.5)	IAE – III (10)	(60)			
Remember	10	10	10	20			
Understand	10	10	10	20			
Apply	30	30	30	60			
Analyze							
Evaluate							
Create							

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# PROFESSIONAL ELECTIVES (PE)

# STREAM III INTERNET OF THINGS:

2009544	PRINCIPLES OF SENSORS AND SUCCESSION				
2003241	CONDITIONING	L	Т	Ρ	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	NIL				

# **Course Objectives**

The course is intended to

- 1. Learn the various types sensor based measurement systems.
- 2. Understand various technologies associated in manufacturing of sensors.
- 3. Acquire knowledge about types of sensors used in modern digital systems.
- 4. Familiarize the Digital and intelligent sensors.
- 5. Get acquainted about material properties required to make sensors.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Appreciate various types of sensors and their construction	Level
CO2	Describe the manufacturing practice of	Understand
CO3	Design systems integrated with same	Understand
CO4	Use sensors specific to the and	Apply
CO5	Classify the material and the end use application	Apply
	classify the material properties required to make sensor	Analyze

# **Course Contents:**

# Unit-I INTRODUCTION TO SENSOR BASED MEASUREMENT SYSTEMS

General concepts and terminology, sensor classification, primary sensors, material for sensors, micro sensor technology, magneto resistors, light dependent resistors, resistive hygrometers, resistive gas sensors, liquid conductivity sensors, Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors.

# Unit-II SIGNAL CONDITIONING FOR REACTANCE VARIATION SENSORS

Problems and Alternatives, ac Bridges Carrier Amplifiers, Coherent Detection, Specific Signal Conditioners for Capacitive Sensors, Resolver-to-Digital and Digital-to-Resolver Converters.

# Unit-III SELF GENERATING SENSOR

Thermoelectric sensor, piezoelectric sensor, Pyroelectric sensor, photoelectric sensor, Electrochemical

# Unit-IV DIGITAL AND INTELLIGENT SENSORS

position encoders, resonant sensors, sensors based on quartz resonators, SAW sensors, Vibrating wire strain gages, vibrating cylinder sensors, Digital flow meters.

# Unit-V SENSORS BASED ON SEMICONDUCTOR JUNCTIONS

Thermometers based on semiconductor junctions, magneto diodes and magneto transistors, photodiodes and phototransistors, sensors based on MOSFET transistors, charge-coupled sensors: types of CCD imaging sensors, ultrasonic-based sensors.

Total: 45 Periods

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### **Text Books:**

- 1. Clarence W. de Silva, "Sensor Systems-Fundamentals and Applications", CRC Press, Edition 2016.
- 2. Ramon PallasAreny, John G. Webster, "Sensors and Signal conditioning", John Wiley and Sons 2nd edition, 2000.

### Reference Books:

- 1. Jon. S. Wilson, "Sensor Technology Hand Book", Elsevier Netherland, 1st edition 2011.
- 2. Jacob Fraden, "Handbook of Modern Sensors" Springer; 4th edition 2010
- 3. Patranabis D, "Sensors and Transducers" Prentice Hall India Learning Private Limited, 2nd edition, 2003.

### Additional References:

- 1. https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod2.pdf
- 2. https://www.coursera.org/lecture/intelligent-machining/signal-processing-iFBoY
- 3. https://nptel.ac.in/courses/108/108/108108147/

Map	oing o	of Cou	irse Ou	itcome	es (CO	) with I	Progra	mme (	Outcor	nes (P	O) and	Progr	amme	Speci	fic
						Οι	itcome	es (PS	C)		11				
COs	-	POs						1	PSOs						
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3		1	2	2				2	3	2	3	2
CO2	3	3	3		1	2	2				2	3	2	3	2
CO3	3	3	3		1	2	2				2	3	2	3	2
CO4	3	3	3		1	2	2				2	3	2	3	2
CO5	3	3	3		1	2	2		1		2	3	2	3	2
	3	4	High			2	1	Vediun	n		1		Low		

Formative assessment						
Bloom's Level	Assessment Component	Marks	Total marks			
Remember	Online Quiz	5				
Understand	Tutorial Class / Assignment	5	15			
	Attendance	5				

Summative Assessment						
Bloom's Category	Intern	Final Examination				
	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)		
Remember	10	10	10	20		
Understand	30	30	30	60		
Apply	10	10	10	20		
Analyze			10	20		
Evaluate	1					
Create						

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20CSE42	DATA ACQUISITION	L	Т	P	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Database Management System			_	

## **Course Objectives**

The course is intended to

- 1. Understand the basic concepts of data Warehouse and data mining.
- 2. Explore the fundamental concepts of data pre-processing, extraction, cleaning, annotation,
- 3. Familiarize the various visualization techniques.
- 4. Understand the various data visualization tools.
- 5. Recognize data productization using Internet of thing.

### Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
C01	Recognize the fundamental concepts of data warehouse ,data mining ,data	Level
0.00	Apply of data pre-processing extraction clooping constation in the	Understand
CO2	on data	Apply
CO3	Explore the basic concept of data visualization	Analyze
CO4	Classify the suitable visualization techniques to output analytical results	Analyze
C05	Explore on applications using Internet of things	Analyze

### Course Contents:

# Unit-I INTRODUCTION TO DATA WAREHOUSE & DATA MINING

Introduction to Data Warehouse- OLTP and OLAP concepts, Introduction to Data Mining, Data Objects and Attribute Type, Basic Statistical Descriptions of Data, Exploratory Data analysis, Measuring Data Similarity and Dissimilarity, Graphical representation of data.

# Unit-II INTRODUCTION TO DATA ACQUISITION

Introduction to Data Acquisition, Applications, Process, Data Extraction, Data Cleaning and Annotation, Data Integration, Data Reduction, Data Transformation, Data Discretization and Concept Hierarchy Generation.

### Unit-III DATA VISUALIZATION

Visualization-Introduction, Terminology, Basic Charts and Plots, Multivariate Data Visualization, Data Visualization Techniques, Pixel, Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

# Unit-IV DATA VISUALIZATION TOOLS

Introduction to Data Visualization Tools- Rank Analysis Tools, Trend Analysis Tools, Multivariate Analysis Tools, Distribution Analysis Tools, Correlation Analysis Tools, Geographical Analysis Tools.

# Unit-V DATA PRODUCTIZATION USING INTERNET OF THINGS

IoT Overview, IoT Design methodology, Semantic Web Infrastructure, Intelligence Applications, 9 Programming Framework for IoT, Distributed Data Analysis for IoT, Security and Privacy in IoT,

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Applied IoT, Cloud Based Smart Facilities Management. Virtualization on Embedded Boards IoT, Stream Processing in IoT, Internet of Vehicles and Applications, Case study on Data Acquisition using Dashboards, Android and iOS apps..

### Text Books:

Total: 45 Periods

- 1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things -A hands-on approach", Universities Press, 2015.
- 2. Han, Jiawei, Jian Pei, and Micheline Kamber, "Data mining: concepts and techniques", 3rd Edition, Elsevier, 2011.

### **Reference Books:**

- 1. Rajkumar Buyya, Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms", Elsevier, 2016.
- 2. Karl Pover, "Learning Qlikview Data Visualization", Packt, 2013.
- 3. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2012.

### Web reference:

- 1. https://freevideolectures.com/course/4943/nptel-industrial-automation-control-coursesponsored-aricent/7
- 2. http://nitttrc.edu.in/nptel/courses/video/108105088/L07.html
- 3. https://www.youtube.com/watch?v=I\_9Pwyxhe40

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific **Outcomes** (PSOs) Pos **PSOs** Cos CO1 CO2 CO3 CO4 CO5 3 High Medium Low

Formative assessment							
Bloom's Level	Assessment Component	Marks	Total marks				
Remember	Online Quiz	5	marks				
Understand	Tutorial Class / Assignment	5	15				
	Attendance	5					

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
	IAE - I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	20
Understand	30	20	10	20
Apply	40		30	60
Analyze	10	10	10	20
Evaluate				
Create				

Passed in Board of studies Meeting 25.02.2022

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20CSE43	WIRELESS SENSOR NETWORKS	L	T	P	С
		3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	NIL				

### **Course Objectives**

The course is intended to

- 1. Understand the concepts of wireless sensor networks
- 2. Acquire knowledge on the architecture for WSN and design WSN to analyze its performance
- 3. Recognize the layer approach in sensor networks
- 4. Establish the new infrastructure model
- 5. Exposure to mote programming platforms and tools.

# **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
C01	Understand the basics of Wireless Sensor Networks and its design principles	Understand
CO2	Gain knowledge on the architecture and placement strategies of Sensors	Understand
CO3	Apply the knowledge to identify appropriate layer protocols with the suitable routing algorithm based on the network and user requirement	Apply
CO4	Demonstrate the establishment of the networking infrastructure	Apply
C05	Build basic modules and be familiar with the OS used in Wireless Sensor Networks	Apply

### **Course Contents:**

## UNIT I INTRODUCTION OF WIRELESS SENSOR NETWORKS

Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture, Hardware components, Energy consumption of sensor nodes, Network architecture, Sensor network scenarios, Design principles.

### **UNIT II ARCHITECTURES**

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

## UNIT III NETWORKING SENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols-Energy-Efficient Routing, Geographic Routing.

# UNIT IV INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

# UNIT V SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware - Berkeley Motes, Programming Challenges, Node-level software platforms -

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TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

### **Total: 45 Periods**

### Text Books:

- 1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2007.
- 2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

### **Reference Books:**

- 1. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2017.
- 2. Sitharama Iyengar S, Nandan Parmeshwaran, Balkrishnan N and Chuka D, "Fundaments of Sensor Network Programming, Applications and Technology", John Wiley & Sons, 2011.
- 3. Fei Hu and Xiaojun Cao, "Wireless Sensor Networks Principles and Practice", CRC Press, 2010

### Web reference:

- 1. https://nptel.ac.in/courses/106/105/106105160/
- 2. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/
- 3. https://www.digimat.in/nptel/courses/video/106105160/L26.html

Cos					Р	os		PSOs							
003	1	2	3	4	5	6	7	8	9	10	11	12	1	1 2	
CO1	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO2	3	3	3	3									3	1	
CO3	3	3	3	3									3	3	
CO4	3	3	3	3									2	2	
CO5	3	3	3	3									3	3	3
19 A.	3	High				2	2 Medium 1						.ow		

	Formative assessment								
Bloom's Level	Assessment Component	Marks	Total marks						
Remember	Online Quiz	5							
Understand	Tutorial Class / Assignment	5	15						
	Attendance	5	-						

	Summ	ative Assessme	ent	
Bloom's Category	Intern	al Assessment E	Examinations	Final Examination
Bioom s dategory	1AE – I (7.5)	IAE – II (7.5)	IAE – III (10)	(60)
Remember	15	15	10	20
Understand	20	15	20	30
Apply	15	20	20	30
Analyze	0	0	0	20
Evaluate	0	0	0	0
Create	0	0	0	0

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20CSE44	EDGE COMPUTING TECHNOLOGIES	L	T	P	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	NIL				

# **Course Objectives**

The course is intended to

- 1. Understand the concepts of IoT
- 2. Acquire knowledge of IoT and M2M communication
- 3. Recognize the protocols and standards of IoT
- 4. Identify the Fog computing Architecture and its components
- 5. Exposure the integration of Fog and Cloud Computing.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Understand the concepts of IoT	Level
CO2	Apply the M2M protocol in IoT	Understand
CO3	Habitual with Fog computing in IoT	Apply
CO4	Familiarize with IoT standard and protocols	Apply
0.05	Appriso with England Olive t	Apply
	Apprise with Fog and Cloud computing in IoT	VlqqA

### **Course Contents:**

# UNIT I INTRODUCTION TO IOT

Technologies in IoT, IoT Applications- Smart Home, Wearable, Connected Cars, Industrial IoT, Smart Cities, Agriculture, Smart Retail, smart Grid, Healthcare, Challenges in IoT- Delivering Value to Customers, Hardware Compatibility Issues, Data Connectivity Issues, Introduction to Edge Computing, Need for Edge Computing- Improved Performance, Compliance, Data Privacy, And Data Security.

### UNIT II IOT ARCHITECTURE

IoT Architecture Data Acquisition, Data Aggregation and Data Analysis, IoT Protocols- COAP, MQTT, 9 XMPP, AMQP, Low power Lossy Network routing, Communication Methods- Bluetooth, Zigbee, Wireless Fidelity,4G Sigfox, NeU,5G.

# UNIT III FOG COMPUTATIONAL MODEL

Fog Simulators, iFogSim, FogTorch, Cisco IoX and Fog Application, Contiki/Cooja, NS3 PVFOg simulator.

# UNIT IV BIG DATA

Data Types in Big data, Characteristics of BIG DATA, Benefits of Big Data, Big Data Application, Layered Big Data Architecture- Data Ingestion, Data collection, Data Processing Layer, Data storage, Data Query and Visualization Layer, Big Data Implementation- Hortonworks, Cloudera, MAP R, Edge Computing for Big Data.

# UNIT V RECENT TRENDS

Case Study-1: Edge analytics in Irrigation System -Machine Learning in Edge for automation in 9 Irrigation system. Case study 2: Edge analytics for Water Quality Monitoring- Machine Learning in

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Edge for automation in water quality monitoring Case Study 3 IoT-Edge for Smart Energy, Case Study 4: IoT- Edge for water demand forecasting.

### Text Books:

Total: 45 Periods

- 1. K.Anithakumari, G.Sudha Sadasivam, D.Dharani, M.Nirjanamurthy "Edge Computing Fundamentals, Advances and Applications", CRC press Published December 23, 2021.
- 2. Reem Abdul Rahman and Babar Shah, "Security analysis of IoT protocols: A focus in CoAP," MEC International Conference on Big Data and Smart City, 2016.

### **Reference Books:**

- 1. D. Airehrour, J. Gutierrez and S. K. Ray, "Secure routing for internet of things: A survey," Journal of Network and Computer Applications, 2016.
- 2. Maria Rita Palattella et al., "Standardized protocol stack for the internet of (important) things," IEEE Communications Surveys and Tutorials, 2013.
- 3. Ashton Kevin, "That Internet of Things Thing," RFID Journal, 2009.

### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105167/
- 2. https://www.youtube.com/watch?v=rifFwHPIOrs
- https://onlinecourses.nptel.ac.in/noc19 cs64/preview

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

					-				000	1						
Cos						Р	os			-			PSOs			
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	3	2	3							3	3	3	3	
CO2	3	2	3	2	3							3	3	3	3	
CO3	3	2	3	2	3				R			3	3	3	3	
CO4	3	2	3	2	3						-	3	3	- 3	3	
CO5	3	2	3	3	3						-	3	3	3	3	
	3	High				2	Mediu	ım				1	Low			

	Formative assessment								
Bloom's Level	Assessment Component	Marks	Total marks						
Remember	Online Quiz	5							
Understand	Tutorial Class / Assignment	5	15						
	Attendance	5							

	Su	mmative Asse	ssment	
Bloom's Category	Internal A	ssessment Exa	aminations	Terminal Examination
Diooning outegoly	IAE – I (7.5)	IAE – II (7.5)	IAE - III (10)	(60)
Remember	15	15	10	20
Understand	20	15	20	20
Apply	15	20	20	
Analyze	0	0	0	30
Evaluate	0	0	0	20
Create	0	0	0	0
	0	U	0	0

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20CSE45		L	Т	Ρ	C
		3	0	0	3
Nature of Course	Professional Elective			-	
Pre requisites	Computer Networks		-	-	-

### **Course Objectives**

The course is intended to

- 1. Learn the basic concepts of mobile computing
- 2. Discuss the methods of mobile telecommunication system.
- 3. Familiar with the mobile network and transport layers
- 4. Explore in the field of mobile Adhoc wireless networks.
- 5. Gain knowledge about different mobile platforms and application development

### **Course Outcomes**

On successful completion of the course, students will be able to

Co.No	Course Outcome	Bloom's Level
CO1.	Explain the basics of mobile telecommunication system	Understand
CO2.	Illustrate the generation of telecommunication systems in wireless network.	Understand
CO3.	Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network.	Apply
CO4.	Explain the functionality of mobile adhoc wireless networks	Apply
CO5.	Develop a mobile application using android, blackberry, iOS and Windows	Apply

### Course Contents:

## UNIT - I FUNDAMENTALS OF MOBILE COMPUTING

Introduction to Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications - Characteristics of Mobile computing -- Structure of Mobile Computing Application– Mobile Wireless Transmission –MAC: SDMA – FDMA – TDMA – CDMA.

# UNIT - II MOBILE TELECOMMUNICATION SYSTEM

Introduction to Cellular Systems – GSM –Services and Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS-UMTS – Architecture – Handover – Security- 3G wireless systems.

# UNIT - III MOBILE NETWORK AND TRANSPORT LAYER

Infra-Red Vs. Radio Transmission – Infrastructure and Adhoc Network – Mobile IP – Mobile Adhoc Networks – Traditional TCP and classical TCP improvements.

# UNIT - IV MOBILE ADHOC WIRELESS NETWORKS

Adhoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security 4G Vision – 4G Features and Challenges – Applications of 4G. 4G Technologies – LTE FDD Vs TDD comparison–5Gwireless systems.

# **UNIT - V MOBILE PLATFORMS AND APPLICATIONS**

Mobile Device Operating Systems – Special Constrains and Requirements – Commercial Mobile Operating Systems – Software Development Kit: Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros and Cons – Mobile Payment System – Security Issues.

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### **Text Books:**

# Total: 45 Periods

- 1. Jochen H. Schller, "Mobile Communications", Pearson Education, New Delhi, Second Edition, 2012.
- 2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi, Second Edition, 2012.

### Reference Books:

- 1. Vijay Garg K, "Wireless Communications and Networks, Morgan Kaufmann Publishers (Elsevier), Mexico, Second Edition, 2007.
- 2. Clint Smith and Daniel Collins, "3G Wireless Networks", Tata McGraw Hill, New Delhi, Second Edition, 2007.
- 3. William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Tata McGraw Hill, India, Second Edition, 2006.

### Additional References:

- 1. https://nptel.ac.in/courses/106/106/106106147/
- 2. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/
- 3. https://www.digimat.in/nptel/courses/video/106106147/L16.html

Марр	oing of	Cours	se Out	comes	s (COs	) with Outc	Progra omes	amme (PSOs	Outco )	omes (F	POs) P	rograr	nme S	pecifi	ic
Cos						P	Os						F	SOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	
CO2	3	2	2	1	-								3	1	
CO3	3	2	1	1					-				3	1	
CO4	3	3	2	1									3	1	-
CO5	3	3	2	2									3	1	-
	3		Hi	gh		2		Med	lium		1		Lov	N	

	Formative assessment			
Bloom's Level	Assessment Component	Marks	Total	
Apply	Classroom or Online Quiz	5		
Understand	Class Presentation/Power point presentation	5	15	
	Attendance	5	- 13	

	Summ	ative Assessmen	nt	
	Contin	uous Assessmen	nt Tests	Final
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination
Remember	10	10	10	10
Understand	20	20	20	10
Apply	20	20	20	40
Evaluate		20	20	50
	0	0	0	0
Create	0	0	0	0

Passed in Board of studies Meeting 25.02.2022

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Approved in Academic Council Meeting 09.03.2022

20CSE46	WEARABLE COMPUTING	L	T	P	C
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Computer Networks	and the second second			

# **Course Objectives**

The course is intended to

- 1. Learn advanced and emerging technologies in wearable computing.
- 2. Understand how to use software programs to perform varying and complex tasks.
- 3. Expand upon the knowledge learned and apply it to solve real world problems.
- 4. Identify the requirement's to design the Frameworks.
- 5. Apply I/O Communication Protocols.

### **Course Outcomes**

On successful completion of the course, students will be able to

Course Outcome	Bloom's Loval
Understand the basics of Wearable Components	Understand
Develop Android and Wear applications for Android phone and wearable device	Understand
Enable to explore innovations with Wearable's	Apply
Learn about the requirement's to design Frameworks for Wearable Computing	Apply
Able to learn about I/O communication protocols	Apply
	Course Outcome         Understand the basics of Wearable Components         Develop Android and Wear applications for Android phone and wearable         device         Enable to explore innovations with Wearable's         Learn about the requirement's to design Frameworks for Wearable         Computing         Able to learn about I/O communication protocols

### **Course Contents:**

# UNIT - I INTRODUCTION TO WEARABLE COMPONENTS

Introduction - History - Open Source Platforms - PIC - Arduino, Sketch, Raspberry Pi, Iterative coding methodology - Python Programming - Mobile phones and similar devices - Arm Devices - Basic Electronics (circuit theory, measurements, parts identification).

# UNIT -- II BUILDING BLOCKS FOR WEARABLE COMPUTING

9 Bluetooth Low Energy (BLE), Embedded Software Programming, Sensors for Wearables, Data from Wearable Device Android Wear, Apple WatchKit, Cloud Services, Google Fit, Apple Health Kit.

# UNIT -- III INNOVATION WITH WEARABLES

Process for Lifestyle Innovation, Prototyping and Modelling, Working with a Wearable Device, Three-Tier Architecture for Wearables, Useful Design Patterns and Methods, Multithreading and Concurrency for Wearables, Performance Tuning Retrieval and Analysis of Sensor Data.

# UNIT - IV FRAMEWORKS FOR WEARABLE COMPUTING

Software: open Frameworks (C/C++) - "Arduino" Language (C/C++) - Hardware: Desktop / Laptop /Raspberry Pi - Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, Analog to Digital Conversion - Digital to Analog Conversion)- Microcontrollers - Communication -Serial& Parallel - Hardware to Hardware Communication - I2C/IIC (InterIntegrated Circuit) - SPI (Serial Peripheral Interface).

# UNIT - V BODY AREA NETWORKS

Q Typical m-Health System Architecture- Hardware Architecture of a Sensor Node- Communication Medium, Power Consumption Considerations, Communication Standards- Network Topologies Commercial Sensor Node Platforms- Bio-physiological Signals and Sensors, BSN Application Domains- Developing BSN Applications- Programming Abstractions- Requirements for BSN Frameworks- BSN Programming Frameworks.

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### **Total: 45 Periods**

### **Text Books:**

- 1. Fortino, Giancarlo, Raffaele Gravina, and Stefano Galzarano, "Wearable computing: from modeling to implementation of wearable systems based on body sensor networks", John Wiley & Sons, 1st edition, 2018.
- 2. Linowes Jonathan, "Augmented Reality for Developers", Packt Publishing Limited, 1 st edition, 2017.

### **Reference Books:**

- 1. Stephan Lukosch, Sang-Won Leigh et.al," Fundamentals of Wearable Computers and Augmented Reality", Excelic Press, 2019.
- 2. Simon Monk, "Programming the Raspberry Pi: Getting Started with Python" McGraw-Hill 2nd edition, 2016.
- 3. Barfield, Woodrow, "Fundamentals of wearable computers and augmented reality", CRC press, 1st edition 2015.

### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105163/
- 2. https://nptel.ac.in/courses/106/105/106105166/
- 3. https://www.youtube.com/watch?v=yQwYobTllr0

Марр	ing of	Cours	e Out	comes	(COs	) with Outc	Progra omes (	mme PSOs	Outco )	mes (F	POs) P	rograr	nme S	pecifi	C	
CO2		POs														
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	1	1			12						3	1		
CO2	3	2	2	1									3	1		
CO3	3	2	1	1		1							3	1		
CO4	3	3	2	1									3	1	-	
CO5	3	3	2	2									3	1		
	3	3 High 2				2	Medium 1				1		Low			

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Apply	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
	Attendance	5	-

	Summ	ative Assessme	nt	
	Continu	Jous Assessme	nt Tests	Final
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	20	40
Apply	20	20	20	50
Evaluate	0	0	0	0
Create	0	0	0	0

Passed in Board of studies Meeting 25.02.2022

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20CSE47	IOT PROGRAMMING	L	Т	P	С
Nature of Course	Professional Elective	3	0	0	3
Pre requisites	Computer Networks				

# **Course Objectives**

The course is intended to

- 1. Identify the basics of Smart Objects and IoT Architectures.
- 2. Apply the various IOT-related protocols
- 3. Build simple IoT Systems using Arduino and Raspberry Pi.
- 4. Comprehend data analytics and cloud in the context or IoT.
- 5. Develop IoT infrastructure for popular applications.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's
CO1	Interpret the concept of IoT	Level
CO2	Solve the various protocols for IoT	Understand
CO3	Design a PoC of an IoT system using Pasaborny Di/Arduing	Apply
CO4	Apply data analytics and use cloud offering related to to T	Apply
CO5	Analyze applications of IoT in real time.	Apply
	ranges applications of for in real time scenario.	Analyze

## **Course Contents:**

## Unit - I FUNDAMENTALS OF IoT

Evolution of Internet of Things - Enabling Technologies - IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models - Simplified IoT Architecture and Core IoT Functional Stack - Fog, Edge and Cloud in IoT - Functional blocks of an IoT ecosystem - Sensors, Actuators, Smart Objects and Connecting Smart Objects.

## Unit- II IoT PROTOCOLS

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN - Network Layer: IP versions, Constrained Nodes and Constrained Networks - Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks - Application Transport Methods: Supervisory Control and Data Acquisition - Application Layer Protocols: CoAP and MQTT.

# Unit - III DESIGN AND DEVELOPMENT

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

# Unit - IV DATA ANALYTICS AND SUPPORTING SERVICES

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest - Role of Machine Learning - No SQL Databases - Hadoop Ecosystem - Apache Kafka, Apache Spark - Edge Streaming Analytics and Network Analytics - Xively Cloud for IoT, Python Web Application Framework - Django - AWS for IoT - System Management with NETCONF-YANG.

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### Unit-V CASE STUDIES/INDUSTRIAL APPLICATIONS

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Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Some special lattices – Boolean algebra-Definition and Examples.

### Total: 45 Periods

### Text Books:

- 1. Sudeep Mishra, Anandarupmukherjee and Arijit Roy, "Introduction to IoT", New Delhi: University Cambridge Press, 2021.
- 2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.

### Reference Books:

- 1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things A hands-on approach", Universities Press, 2015.
- 2. Jan Ho" ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
- 3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things Key applications and Protocols", Wiley, 2012.

### Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc21\_cs17/preview
- 2. https://nptel.ac.in/courses/106/105/106105166/
- 3. https://onlinecourses.nptel.ac.in/noc20\_cs69/preview

Марр	ing of	Cours	e Out	comes	(COs	) with Outc	Progra omes	amme (PSOs	Outco	mes (F	POs) P	rograr	nme S	specifi	ic
CO2		POs													
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1			-						3	1	
CO2	3	2	2	1									3	1	
CO3	3	2	1	1			_						3	1	
CO4	3	3	2	1									3	1	
CO5	3	3	2	2						6			3	1	
	3		Hi	igh		2	Medium				1		Low		

Formative assessment									
Bloom's Level	Assessment Component	Marks	Total marks						
Remember	Online Quiz	5							
Understand	Tutorial Class / Assignment	5	15						
	Attendance	5	- 15						

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Cos		Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-		2	-	-			-	2	2	2	2
CO2	3	2	2	-	-	2			-	-	-	2	2	2	2
CO3	3	2	2	-	2	2	-	-		-	-	2	2	2	2
CO4	3	2	2	-	-	2	-	-		-	-	2	2	2	2
CO5	3	2	2	76	-	2			24	-	14	2	3	3	2

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20CSE48	IOT SECURITY AND TRUST	L	Т	Ρ	С
LUCOLI	ICT CECONITY AND TROOT	3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	IoT Fundamentals and Architecture				

### **Course Objectives**

The course is intended to

- 1. Acquire knowledge about the fundamentals of encryption.
- 2. Learn the concepts of IoT security and wireless networks.
- 3. Gain knowledge about key elements in IoT
- 4. Explore on various access control schemes and concepts
- 5. Compose the various hacking laws and forensics.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the basics of encryption	Understand
CO2	Identify the concepts of security and wireless network	Apply
CO3	Explore the models of management tools	Apply
CO4	Distinguish the concepts of access control schemes	Analyze
CO5	Design the various hacking methods	Create

### **Course Contents:**

### UNIT- I FUNDAMENTALS OF ENCRYPTION FOR CYBER SECURITY

Cryptography – Need and the Mathematical basics- History of cryptography, symmetric ciphers, and block ciphers, DES – AES. Public-key cryptography: RSA, Diffie-Hellman Algorithm, Elliptic Curve Cryptosystems, Algebraic structure, Triple Data Encryption Algorithm (TDEA).

### UNIT- II IOT SECURITY FRAMEWORK

IIOT security frame work, Security in hardware, Boot process, OS & Kernel application and Runtime environment and containers. Need and methods of Edge Security, Network Security: Internet, Intranet, LAN, Wireless Networks, Wireless cellular networks, Cellular Networks and VOIP.

### UNIT- III ELEMENTARY BLOCKS OF IOT SECURITY

Vulnerability of IoT and elementary blocks of IoT Security, Threat modeling. – Key elements. Identity management Models and Identity management in IoT, Approaches. Using User-centric, Device-centric and Hybrid.

# UNIT- V ACCESS CONTROL IN IOT AND LIGHT WEIGHT CRYPTOGRAPHY

Capability-based access control schemes, Concepts, identity-based and identity-driven, light weight cryptography, need and methods, IoT use cases.

# UNIT- V CYBER CRIMES, HACKERS AND FORENSICS

Cyber Crimes and Laws – Hackers – Dealing with the rise tide of Cyber Crimes - Cyber forensics and incident Response – Network Forensics.

TOTAL: 45 PERIODS

Passed in Board of studies Meeting 25.02.2022



Approved in Academic Council Meeting 09.03.2022

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## **Text Books:**

- 1. Alasdair Gilchrist, "IoT security Issues", Oreilly publications, 2017.
- 2 Parikshit Narendra Mahalle, Poonam N. Railkar, "Identity Management for Internet of Things",
- 3. John R. Vacca, "Computer and Information Security Handbook", Elsevier, 2013.

# **Reference Books:**

- 1. Maryline Laurent, Samia Bouzefrane, "Digital Identity Management", Elsevier, 2015.
- 2. William Stallings, "Cryptography and Network security: Principles and Practice", Pearson Education, 5th Edition, 2014 India.
- 3. Christ of Paar and Jan Pelzl, "Understanding Cryptography A Textbook for Students and Practitioners", Springer, 2014.

# Additional References:

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- 1. nptel.ac.in/courses/106/106/106106146/
- 2. nptel.ac.in/courses/106/105/106105166/
- 3. https://www.youtube.com/watch?v=sMquG8gxRh4

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- Ār	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	5	
	Attandenas	5	15
	Allendance	5	

	Summ	native Assessme	ent			
Bloom's Category	Intern	Final Examination				
2	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)		
Remember	20	20	20	(00)		
Understand	20	20	15	20		
Apply	10	20	15	60		
Analyze	10	10	15	20		
Evaluate						
Create						

Passed in Board of studies Meeting 25.02.2022

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Approved in Academic Council Meeting 09.03.2022

200SE49	IOT APPLICATION AND WEB DEVELOPMENT	L	Т	Ρ	С
1000140	IOT ALL EIGHT ON AND WED DEVELOP WENT	3	0	0	3
Nature of Course	Professional Elective				
Pre requisites	IoT Fundamentals and Architecture				

### **Course Objectives**

The course is intended to

- 1. Identify various applications pertaining to Industrial IoT.
- 2. Impart knowledge on IoT for healthcare.
- Explore agricultural applications of IoT.
- 4. Acquire specific scripting knowledge to develop interactive applications.
- 5. Create the basics of android application development.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bioom's Level
CO1	Understand role of IoT in Industry	Understand
CO2	Identify the healthcare applications of IoT	Apply
CO3	Identify the agricultural applications of IoT	Apply
CO4	Apply scripting language knowledge for development	Analyze
CO5	Invent the mobile application using android SDK	Create

### **Course Contents:**

### UNIT - I INDUSTRIAL INTERNET APPLICATION

IIoT Fundamentals and Components - Industrial Manufacturing - Monitoring, Control, Optimization and Autonomy - Introduction to Hadoop and big data analytics

### **UNIT-II HEALTH CARE APPLICATIONS**

Architecture of IoT for Healthcare - Multiple views coalescence - SBC-ADL to construct the system architecture. Use Cases: Wearable devices for Remote monitoring of Physiological parameter - ECG, EEG - Diabetes and Blood Pressure.

### **UNIT- III APPLICATIONS IN AGRICULTURE**

Smart Farming: Weather monitoring - Precision farming, Smart Greenhouse - Drones for pesticides.

### **UNIT-IV SCRIPTING LANGUAGE**

Introduction to JavaScript, Function - DOM - Forms and Event Handlers - Object Handlers - Input validation - J2ME - application design using J2ME - IoT development using Real time rules - platforms - alerts

# UNIT- V ANDROID PROGRAMING FRAMEWORK

Mobile app development: Android Development environment - Simple UI Layouts and layout properties - GUI objects - Event Driven Programming - opening and closing a Database

### Total: 45 Periods

### **Text Books:**

- 1. John Dean, "Web Programming with HTML5, CSS and JavaScript", Jones and Bartlett Publishers Inc., 2018.
- 2. DiMarzio J. F., "Beginning Android Programming with Android Studio", Wiley, 4<sup>TH</sup> Edition, 2016.

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Approved in Academic Council Meeting 09.03.2022

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# **Reference Books:**

- 1. Fadi Al-Turjman, "Intelligence in IoT- enabled Smart Cities", CRC Press, 1st edition 2019.
- 2. Giacomo Veneri, and Antonio Capasso, "Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0", Packt Publishing, 2018.
- 3. Subhas Chandra Mukhopadhyay, "Smart Sensing Technology for Agriculture and Environmental Monitoring", Springer, 2012.

# Additional References:

- 1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-e28/
- 2. https://nptel.ac.in/courses/106/105/106105166/
- 3. https://nptel.ac.in/courses/106/105/106105195/

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COS	1	2	3	4	5	6	7	8	9	10	11	12	1	F308	2
CO1	3	2	2	-	-	1.1	-	-	-			1	2	2	3
CO2	3	3	2	-	-	-		-				1	2	-	
CO3	3	2	2		-		120	-	<u> </u>			1	3		-
CO4	2	1	1	-	2		120			-	-			-	-
005	3	2	2	- 35-1	2	1.75	1.2			-			1	-	-

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	- 10

	Summ	native Assessme	nt			
Bloom's Category	Intern	Final Examination				
biooning outegory	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)		
Remember	10	10	10	20		
Understand	30	30	30	60		
Apply	10	10	10	20		
Analyze				20		
Evaluate						
Create						

Passed in Board of studies Meeting 25.02.2022

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20CSE50	INDUSTRIAL INT	L	T	P	С
		3	0	0	3
Nature of Course	Professional Elective		ł	-	
Pre requisites	IoT Fundamentals and Architecture		-		

### **Course Objectives**

The course is intended to

- 1. Understand the role of Internet of things.
- 2. Identify the sensor networks and roles of embedded PC in IIoT.
- 3. Report on the strengths and vulnerabilities of the tested network.
- 4. Identify legal and ethical issues related to vulnerability and penetration testing
- 5. Implement penetration testing for malwares

### Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the concept of Industrial IoT (IIoT) Systems	Understand
CO2	Analyze the Implementation systems of IoT	Analyze
CO3	Analyze the data monitoring and control techniques.	Analyze
CO4	Point out next generation sensors	Analyze
CO5	Analyze the applications of IIoT	Analyze

### **Course Contents:**

# UNIT - I INTRODUCTION TO INDUSTRIAL IOT (IIOT) SYSTEMS:

The Various Industrial Revolutions, Role of Internet of Things (IoT) &Industrial Internet of Things (IIoT)in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories.

#### UNIT-II IMPLEMENTATION SYSTEMS FOR IIOT

Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems.

# UNIT - III IIoT DATA MONITORING & CONTROL

IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology.

# UNIT - IV CYBER PHYSICAL SYSTEMS

Next Generation Sensors, Collaborative Platform and Product Lifecycle management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis.

#### UNIT-V INDUSTRIAL IOT- APPLICATIONS

Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and (Including AR and VR safety applications), Facility Management.. Security

Total periods: 45

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### Text Books:

- 1. Alasdair Gilchris,"Industry 4.0: The Industrial Internet of Things "Gilchrist Publications, 2016.
- Bartodziej, Christoph Jan "The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics" Springer: Publication, Edition 2016.

### Reference Books:

- 1. Alasdair Gilchrist "Industry 4.0: The Industrial Internet of Things", Apress Publication, 2017.
- 2. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat "Industrial Internet of Things: Cyber manufacturing Systems" (Springer), Edition 2017.
- 3. Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, Edition 2013.

# Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105195/
- 2. https://onlinecourses.nptel.ac.in/noc20\_cs66/preview
- 3. https://onlinecourses.nptel.ac.in/noc21\_cs17/preview

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CO1	3	2	1	1		3	2		-	-		1	2	3	2		
CO2	3	2	2	1	3	3	1		: -: :	-			3	2	-		
CO3	3	2	2	2	3	3			-	-	2	1	2	2			
CO4	3	3	2	1		3	3	1	1	2	1		2	3			
CO5	3	2	2	3	2	3	2	1	121		1	1	2	3			

26	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	-

	Summ	native Assessme	nt	
Bloom's Category	Intern	al Assessment E	xaminations	Final Examination
Bioom a category	IAE I (7.5)	IAE – II (7.5)	IAE III (10)	(60)
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyze				
Evaluate				
Create				

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### **OPEN ELECTIVES (OE)**

20CSO01	BIG DATA TOOLS & ANALYTICS	L	Т	P	С
	BIO BATA TOOLO & ANALTTICO	3	0	0	3
Nature of Course	Open Elective				
Pre requisites	Database Management Systems				

### **Course Objectives**

The course is intended to

- 1. Understand the Big Data Platform and provide an overview of Apache Hadoop.
- 2. Provide HDFS Concepts and Interfacing with HDFS.
- 3. Understand Map Reduce Jobs.
- 4. Apply analytics on Hadoop Eco System
- 5. Exposure to Data Analytics with R.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Identify Big Data and its Business Implications.	Understand
CO2	List the components of Hadoop and Hadoop Eco-System	Understand
CO3	Complete the Access and Process Data on Distributed File System	Apply
CO4	Develop Big Data Solutions using Hadoop Eco System	Apply
CO5	Apply Machine Learning Techniques using R.	Apply

### **Course Contents:**

### UNIT - I INTRODUCTION TO BIG DATA AND HADOOP

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analyzing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

### UNIT -II HDFS (HADOOP DISTRIBUTED FILE SYSTEM)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

### **UNIT – III MAP REDUCE**

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

### **UNIT – IV HADOOP ECO SYSTEM**

Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase: HBasics, Concepts, Clients, Example, Hbase versus RDBMS. Big SQL: Introduction.

### UNIT -V DATA ANALYTICS WITH R

Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Total: 45 Periods

Passed in Board of studies Meeting 25.02.2022

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# Text Books:

- 1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley, First Edition, 2015.
- 2. Tom White "Hadoop: The Definitive Guide", O'reily Media, 3rd Editon, 2012.

# **Reference Books:**

- 1. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press, 1st
- 2. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Haduop", McGraw-Hill/Osborne Media Oracle
- 3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 1st Edition, 2007.

# Additional References:

- 1. nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs33/
- 2. https://www.digimat.in/nptel/courses/video/106104189/L06.html
- 3. https://www.youtube.com/watch?v=k7zu3NXEiGY

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CO5	3	2	2	2	0				-				3	3	- 3

1	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	5	
	Attendance	5	15
	riteridance	5	1

	Summ	native Assessme	ent						
Bloom's Category	Intern	Internal Assessment Examinations							
	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)					
Remember	10	10	10	(00)					
Understand	30	20	10	20					
Apply	10	30	30	60					
Analyze	10	10	10	20					
Evaluate									
Create		11.2							

Passed in Board of studies Meeting 25.02.2022

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2005002	IOT ARCHITECTURE AND PROTOCOLS	L	T	Р	С
2000002	IOT AROUNTEOTORE AND TROTOCOES	3	0	0	3
Nature of Course	Open Elective	/h	-		L
Pre requisites	Computer Hardware and Networking				

### **Course Objectives**

The course is intended to

- 1. Learn the Architectural Overview of IoT
- 2. Understand the IoT Reference Architecture and Real World Design Constraints.
- 3. Understand the purpose of data link and network Protocols in IoT
- 4. Discuss on Transport and Session layer in IoT applications
- 5. Evaluate the knowledge and technical skills in designing secured and trustable IoT systems

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	No Course Outcome					
CO1	Identify the basic Architectural components of IoT	Understand				
CO2	Identify the techniques of Referential architecture and its constraints	Understand				
CO3	Construct the mapping process between the data link layer and network layer	Apply				
CO4	Provide end-to-end lot reliable communications	Analyze				
CO5	Measure the security systems using Trustable IoT systems	Evaluate				

### **Course Contents:**

### **Unit - I OVERVIEW**

IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management

### Unit-II REFERENCE ARCHITECTURE

IoT Architecture-State of the Art - Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

# Unit - III IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

# Unit - IV TRANSPORT & SESSION LAYER PROTOCOLS

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) - Session Layer- HTTP, CoAP, XMPP, AMQP, MQTT.

# Unit-V SERVICE LAYER PROTOCOLS & SECURITY

Service Layer -oneM2M, ETSI M2M, OMA, BBF - Security in IoT Protocols - MAC 802.15.4, 6LoWPAN, RPL, Application Layer.

**Total: 45 Periods** 

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### Text Books:

- 1. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM MUMBAI, 1st Edition, 2016.
- 2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press, 1st Edition, 2014.

### Reference Books:

- 1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on- Approach)", VPT, 1st Edition, 2014.
- 2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publications, 1st Edition, 2013.
- 3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", Springer, 1st Edition, 2011.

## Additional References:

- 1. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot\_prot/index.html
- 2. http://www.digimat.in/nptel/courses/video/106105166/L28.html
- 3. https://www.youtube.com/watch?v=oBZnySDgst8

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CO2	3	3	2	3	-	-		-		ii ai	(a)	1	3	3	3
CO3	3	2	2	2	-		-	-				1	3	3	3
CO4	2	1	1	1	-	-	1	-		-	-	1	3	3	3
CO5	3	2	2	2	-	-	-	-	·•/	-	1	1	3	3	3

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	±1
Understand	Tutorial Class / Assignment	5	15
	Attendance	5	

	Summ	native Assessme	nt							
Bloom's Catagory	Intern	Internal Assessment Examinations								
bloom's category	IAE – I (7.5)	IAE – II (7.5)	IAE - III (10)	(60)						
Remember	10	10	10	20						
Understand	30	30	30	60						
Apply	10	10	10	20						
Analyze			1							
Evaluate			in the state of the second s							
Create										

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20CSO03	PROGRAMMING IN C	L	Т	Ρ	С
		3	0	0	3
Nature of Course	Open Elective				
Pre requisites	Problem Solving Using Python				

### **Course Objectives**

The course is intended to

- 1. Gain Basic knowledge about the algorithms and flowcharts
- 2. Learn basics of C programming data types and looping statements
- 3. Explore the concepts of arrays and string operations
- 4. Get detailed knowledge about functions and pointers
- 5. Impart knowledge on structure and union concepts

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the basics of algorithmic problem solving approaches	Understand
CO2	Apply the fundamental rules of programming language	Understand
CO3	Construct problems on array and string operations	Apply
CO4	Design and debug the programs on functions and pointers	Apply
CO5	Create programs on array of structures and union	Analyze

### Course Contents:

## UNIT I INTRODUCTION TO PROBLEM SOLVING TECHNIQUES

Fundamentals - Computer Hardware - Computer Software - Algorithms - Building blocks of algorithms (statements, state, control flow, functions) - Notation (pseudo code, flow chart, and programming language) - Algorithmic problem solving - Simple strategies for developing algorithms (iteration, recursion). Illustrative problems.

#### UNIT II **C PROGRAMMING BASICS**

Introduction to Programming paradigms -Fundamental rules -- Structure of a 'C' program -- Compilation and Linking processes - Constants, Variables, keywords, Identifier, - Declaring and Initializing variables - storage class-Data Types - Operators and Expressions- Decision Making and Branching -Looping statements -Illustrative programs.

#### ARRAYS AND STRINGS

Arrays - Characteristics, Initialization - Declaration - One dimensional and two dimensional arrays example program- String- String operations - String Arrays. Simple programs-Sorting - Searching -Matrix operations (Addition, subtraction and Multiplication) -selection sort, linear and binary search.

# UNIT IV FUNCTIONS AND POINTERS

Function - Definition of function - User-defined Functions - Declaration of function - Function prototype-Function call- Built-in function( Call by reference - Call by value - Recursion - Pointers - Definition -Initialization -Pointer arithmetic - Pointers and arrays -Illustrative programs.

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# UNIT V STRUCTURES AND UNIONS

Defining Structures and Unions - Structure declaration - Need for Structure data type - Nested structure- pointers and structures- Array of structure- Dynamic memory allocation-singly linked list-Union - Programs using structures and Unions - Pre-processor directives - Illustrative programs.

### Text Books:

# **Total: 45 Periods**

- 1. Herbert schildt, " C: The Complete Reference", lap lambert Academic Publications, fourth
- 2. Ashok N Kamthane, "Programming in C", Pearson Publications, Third edition, 2015.

# **Reference Books:**

- 1. Yashavant Kanetkar, "Let us C", BPB publications, 7th edition, 2017.
- 2. Dennis Ritchie, "The C Programming Language", Pearson publication, Second edition, 2015.
- 3. Behrouz A Forouzan , "A Structured Programming Approach Using C", Brooks/Cole

# Additional References:

- 1. nptel.ac.in/courses/106/105/106105171/
- 2. https://onlinecourses.nptel.ac.in/noc20\_cs06
- 3. nptel.ac.in/courses/106/104/106104128/

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CO1	3	2	2	-	1	-	N					1			
CO2	3	3	2	2	1								2	3	
003	3	2	2		4		-		-	-	-	1	3	3	-
000		2	2		1	-	-		0.78		-	1	2	3	1
CO4	2	1	1	-	1	-	-	144	14	- 1	-	1	2		
CO5	3	2	2		4	1000			-	-			2	3	1

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Appignment	5	
	Attendence	5	15
	Attendance	5	-

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	(00)
Understand	25	20	10	20
Apply	45		20	60
Analyze	15	10	20	20
Evaluate				
Create				

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022

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2008004		L	T	Ρ	С					
2003004	GPU ARCHITECTURE AND PROGRAMMING 3 0 0									
Nature of Course	Open Elective									
Pre requisites	Computer Architecture and Organization									

### **Course Objectives**

The course is intended to

- 1. Acquire knowledge about the GPU architecture and scheduling.
- 2. Learn the concepts of CUDA and its applications.
- 3. Learn to address the common problems and errors.
- 4. Acquaint with the OPENCL basics and its environment
- 5. Explore various algorithms and patterns.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the basics of GPU architecture	Understand
CO2	Identify the concepts of CUDA	Apply
CO3	Explore the issues in CUDA programming.	Apply
CO4	Distinguish the properties of OPENCL	Analyze
CO5	Design the various algorithms and patterns	Create

### Course Contents:

### UNIT-I GPU ARCHITECTURE

Evolution of GPU architectures – Understanding Parallelism with GPU –Typical GPU Architecture – CUDA Hardware Overview – Threads, Blocks, Grids, Warps, Scheduling – Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

### UNIT-II CUDA PROGRAMMING

Using CUDA – Multi GPU – Multi GPU Solutions – Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

### UNIT-III PROGRAMMING ISSUES

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.

### UNIT- IV OPENCL BASICS

OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.

### UNIT -V ALGORITHMS ON GPU

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix – Matrix Multiplication – Programming Heterogeneous Cluster.

### **TOTAL: 45 PERIODS**

### Text Books:

- 1. Jaegeun han, Bharatkumar Sharma, " A Beginner's guide to GPU Programming and parallel computing with CUDA and C/C++, Brooks", Cole Publications, 2019.
- 2. Ben Dennis, "CUDA in your pocket", Boscon publications, 4th Edition, 2016.

Passed in Board of studies Meeting 25.02.2022

Approved in Academic Council Meeting 09.03.2022



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## **Reference Books:**

- 1. Aftab Munshi, "OpenCL Programming Guide", Addison-Wesley Professional publications, 1st
- 2. Garrett Bauman, "CUDA Jump start", Addison-Wesley Professional publications. 2016.
- 3. Alison B Lowndas, "Deep Learning with GPUs: For the beginner", lap lambert Academic

# Additional References:

- 1. nptel.ac.in/courses/106/102/106102114/
- 2. nptel.ac.in/courses/106/105/106105220/
- 3. https://www.youtube.com/watch?v=OSks4GxOyrA

Cos	1	Pos									PSOs	-			
	1	2	3	4	5	6	7	8	9	10	11	12	1	21	2
CO1	3	2	2	-	3	2	-	-	-			1	2	2	3
CO2	3	3	2	-	3	1 2 1							2	2	
CO3	3	2	2	1	1		T				-		3	2	1
000	0	2	4		1		-			-	-	1	2	2	
CU4	2	1	1	~	3	-	-	-	- 1	1	-	1	2	2	1
CO5	3	2	2	-	3	-	-					1	- 1	2	

Formative assessment								
Bloom's Level	Assessment Component	Marks	Total					
Remember	Online Quiz	E	IIIdrKS					
Understand	Tutorial Class / Assignment	5	-					
	Attendance		15					

	Summ	native Assessme	ent	
Bloom's Category	Intern	Final Examination		
	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	20	20	20	(00)
Understand	20	20	15	20
Apply	10	10	15	60
Analyze	10	10	15	20
Evaluate				
Create			1	

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20CSO05	SOFTWARE PROJECT MANAGEMENT	LTPC
	SOFTWARE PROJECT WARAGEWENT	3003
Nature of Course	Open Elective	
Pre requisites	NIL	

### **Course Objectives**

The course is intended to

- 1. Understand the Software Project Planning and Evaluation techniques.
- 2. Plan and manage projects of the software development life cycle (SDLC).
- 3. Learn about the activity planning and risk management principles.
- 4. Develop skills to manage the various phases involved in project management and people management.
- 5. Deliver the successful software projects that support organization's strategic goals.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Understand Project Management principles while developing software	Understand
CO2.	Gain extensive knowledge about the basic project management concepts, framework and the process models	Apply
CO3,	Estimate the risks involved in various project activities.	Apply
CO4.	To manage software projects and control software deliverables.	Analyze
CO5.	Compare the staff selection process and the issues related to people management	Analyze

### Course Contents

### UNIT-I PROJECT EVALUATION AND PROJECT PLANNING

Software Project Management - Activities Methodologies - Categorization of Software Projects -Management Principles and Control - Evaluation technology - Risk evaluation - Strategic program Management - Stepwise Project Planning.

# UNIT-II PROJECT LIFECYCLE AND EFFORT ESTIMATION

Software process and Process Models - Rapid Application development - Agile methods-SCRUM -Managing interactive processes --Basics of Software estimation --Effort and Cost estimation techniques -- COCOMO II A Parametric Productivity Model - Staffing Pattern.

# UNIT-III ACTIVITY PLANNING AND RISK MANAGEMENT

Activity planning -Project schedules -Activities -Sequencing and scheduling -Network Planning models - Forward Pass & Backward Pass techniques - Critical path (CRM) method - PERT technique -Monte Carlo simulation - Resource Allocation - Creation of critical patterns - Cost schedules

# UNIT-IV PROJECT MANAGEMENT AND CONTROL

Framework for Management and control -Collection of data Project termination -Visualizing progress -Cost monitoring -Earned Value Analysis-Project tracking -Software Configuration Management -- Managing contracts-- Contract Management

# UNIT -V STAFFING IN SOFTWARE PROJECTS

Managing people -Organizational behavior -Best methods of staff selection -The Oldham-Hack man job characteristic model --Ethical and Programmed concerns --Working in teams --Decision making -Team structures --Virtual teams --Communications genres and plans

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Total: 45 Periods

### **Text Books**

- Roger S. Pressman, "Software Engineering A Practitioner's Approach", Mc Graw-Hill, 2<sup>nd</sup> Edition, 2017.
- 2. Lan Bob Hughes, Mike Cotterell and Rajib Mall "Software Project Management "Tata McGraw Hill, New Delhi, 5th Edition, 2012.

### **Reference Books**

- 1. RobertK.Wysocki "Effective Software Project Management"-Wiley Publication, 2011.
- 2. Gopalaswamy Ramesh, "Managing Global Software Projects" McGraw Hill Education (India), 2015
- 3. Walker Royce "Software Project Management" Addiscn-Wesley, 1998.

### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105182/
- 2. https://onlinecourses.nptel.ac.in/noc20\_cs68/preview
- 3. https://nptel.ac.in/courses/106/101/106101061/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

				-			PO	Ds					PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1					- N - 1			-	3	1	
CO2	3	2	2	1	2						2	2	3	1	
CO3	3	2	1	1	-	-	-			-		-	3	1	1
CO4	3	3	2	1	2	1		1		-	1	2	3	1	
CO5	3	3	2	2	2	1	-	1			3	2	3	1	
	3	Hig	h		<b>.</b>	2	Mec	lium			5	1		1	

	Formative assessment							
Bloom's Level	Assessment Component	Marks	Total marks					
Remember	Online Quiz	5						
Understand	Tutorial Class / Assignment	5	15					
	Attendance	5						

	Summat	tive Assessmen	t	
Bloom's Category	Internal Ass	essment Exami	nations	Final
	IAE – I (7.5)	IAE – II (7.5)	IAE – III (10)	Examination (60)
Remember	10	10	10	10
Understand	20	20	10	30
Apply	20	20	20	40
Analyze	0	0	10	20
Evaluate	0	0	0	0
Create	0	0	0	0

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2005006	FOUNDATIONS OF BLOCK CHAIN TECHNOLOGY	L	T	Ρ	С
2000000	TOURDATIONS OF BEOCK CHAIN TECHNOLOGY	3	0	0	3
Nature of Course	Open Elective				
Pre requisites	NIL				

### **Course Objectives**

The course is intended to

- 1. Learn the concepts of block chain technologies.
- 2. Understand the technical aspects of crypto currencies block chain technologies and distributed consensus.
- 3. Familiarize potential applications for Bit coin-like crypto currencies.
- 4. Enable an individual to learn, how these systems work.
- 5. Create an individual, how to engineer secure software that interacts with the Bit coin network and other crypto currencies.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand emerging abstract models for Block chain Technology	Understand
CO2	Illustrate the concept of bit coin and mathematical background behind it	Apply
CO3	Apply the tools for understanding the background of crypto currencies	Apply
CO4	Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain	Analyze
CO5	Write the latest advances and its applications in Block Chain Technology	Create

### Course Contents:

### **UNIT - I INTRODUCTION**

Basic of Block chain Architecture - Block chain Design Principles - AAP protocol and its analysis -Nakamoto Consensus - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work ( PoW ) - formal treatment of consistency - Proof of Stake ( PoS ) based Chains - Hybrid models (PoW + PoS).

### **UNIT - II CRYPTOGRAPHIC FUNDAMENTALS**

Cryptographic basics for crypto currency - a short overview of Hashing, cryptographic algorithm - SHA 256, signature schemes, encryption schemes and elliptic curve cryptography - Introduction to Hyperledger- Hyperledger framework - Public and Private Ledgers.

### UNIT - III BIT COIN

Bit coin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity forks - double spending - mathematical analysis of properties of Bit coin.

### **UNIT – IV ETHEREUM**

Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Smart Contracts - some attacks on smart contracts. Ethereum and Smart Contracts - The Turing Completeness of Smart Contract Languages and verification challenges - comparing Bitcoin scripting vs Ethereum Smart Contracts.

### **UNIT - V BLOCK CHAIN-RECENT TREND**

Blockchain Implementation Challenges - Zero Knowledge proofs and protocols in Block chain -Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash attacks on Blockchains - such as Sybil attacks and selfish mining.

**Total: 45 Periods** 

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# Text Books:

- 1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O"Reilly, First edition, 2015. 2. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, 2010.

# **Reference Books:**

- 1. Daniel Drescher, "Block Chain Basics", Apress, First edition, 2017.
- 2. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, First edition, 2012.
- 3. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing, 2010.

# Additional References:

- 1. nptel.ac.in/courses/106/104/106104220/
- 2. nptel.ac.in/courses/106/105/106105184/
- 3. nptel.ac.in/courses/106/105/106105235/

Cos	1		1.0	-	-	P	os			-	5			PSOs	s	
001		4	3	4	5	6	7	8	9	10	11	12	1	2	3	
001	3	2	1	1									3	1 1		
CO2	3	2	2	1	2				1		2	2	0			
CO3	3	2	1	1.						-		2	3			
004	2	-	0				-						3	1		
004	5	3	2	1	2	1		1			1	2	3	1	_	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	5	
	Attendance	5	15
	Australice	5	-

	Summ	ative Assessme	ent	
Bloom's Category	Intern	Final Examination		
Pomomhor	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	(00)
Understand	30	30	10	20
Apply	10	00	30	60
Analyze	10	10	10	20
Evaluate				
Create				

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20CSO07	PRINCIPLES OF CLOUD COMPLITING	L	T	Ρ	С
	I THINGI LEG OF CLOOD COMPOTING	3	0	0	3
Nature of Course	Open Elective		-		0
Pre requisites	Cloud Computing Services			_	

### **Course Objectives**

The course is intended to

- 1. Understand the concept of cloud computing.
- 2. Appreciate the evolution of cloud from the existing technologies.
- 3. Have knowledge on the various layers and models in cloud computing.
- 4. Be familiar with the cloud simulators.
- 5. Appreciate the emergence of virtualization in cloud.

### **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Articulate the main characteristics of cloud computing.	Understand
CO2,	Identify the key and enabling technologies that help in the development of cloud.	Understand
CO3.	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.	Apply
CO4.	Apply cloud simulators in cloud environment.	Apply
CO5.	Implementation and use of cloud using virtualization.	Apply

### **Course Contents:**

# **UNIT - I CLOUD COMPUTING OVERVIEW**

Origins of Cloud computing - Cloud components - Essential characteristics - On-demand self service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

### **UNIT – II CLOUD INSIGHTS**

Architectural influences - High-performance computing, Utility and Enterprise grid computing, Cloud scenarios - Benefits: scalability ,simplicity ,vendors ,security, Limitations - Sensitive information -Application development- security level of third party - security benefits, Regularity issues: Government policies.

# UNIT - III: CLOUD ARCHITECTURE- LAYERS AND MODELS

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service ( PaaS ), features of PaaS and benefits, Infrastructure as a Service ( IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of Cloud computing.

# UNIT - IV: CLOUD SIMULATORS- CLOUDSIM AND GREENCLOUD

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to

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# UNIT - V: INTRODUCTION TO VMWARE SIMULATOR

Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual Machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

### **Total: 45 Periods**

### Text Books:

- 1. Anthony T.Velte, Toby J. Velte Robert Elsenpeter, "Cloud computing a practical approach", TATA McGraw- Hill, 3<sup>rd</sup> eiditon, New Delhi 2017.
- Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que, 1<sup>st</sup> edition, 2008.

### **Reference Books:**

- 1. Judith Hurwitz , Robin Bloor , Marcia Kaufman , Fern Halper, "Cloud computing for dummies", Wiley Publishing Inc, 3rd edition, 2012.
- 2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing (Principles and Paradigms)", John Wiley & Sons Inc., 1st editon, 2011.

### Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105167/
- 2. https://nptel.ac.in/courses/106/104/106104182/
- 3. https://nptel.ac.in/courses/106/105/106105223/

Марр	ing of	Cours	se Out	comes	s (COs	) with Outc	Progra omes	amme (PSOs	Outco )	mes (F	POs) P	rograr	nme S	pecifi	ic
COs						P	os		·				F	SOs	
000	1	2	3	4	5	6	7	8	9	10	11	12	1	2	2
CO1	3	3	3	3	3							3	2	2	2
CO2	3	3	3	3	3							2	5	5	3
CO3	3	3	3	3	3							3	3	3	3
CO4	3	3	3	2	2							3	3	3	3
COF	2	0	0	0	5							3	3	3	3
005	3	3	3	3	3							3	3	3	3
	3		Hi	gh		2		Med	lium		1		Lo	w	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Apply	Classroom or Online Quiz	5	marks
Understand	Class Presentation/Power point presentation	5	15
	Attendance	5	- 15

	Summ	ative Assessme	nt	
Bloom's Category	Continuous Assessment Tests			Final
	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination
Remember	10	10	10	10
Understand	20	20	20	40
Apply	20	20	20	50
Evaluate	0	0	0	0
Create	0	0	0	0

Passed in Board of studies Meeting 25.02.2022



Approved in Academic Council Meeting 09.03.2022
20CSO08	CYBER SECURITY AND ETHICAL	L	Т	Ρ	С			
		3	3 0 0					
Nature of Course	Open Elective							
Pre requisites	NIL							

## **Course Objectives**

The course is intended to

- 1. Understand the difference between threat risk, attack and vulnerability.
- 2. Learn about security concepts in OS and Networks.
- 3. Have knowledge on defenses and security counter measures.
- 4. Understand the concepts of Ethical Hacking.
- 5. Evaluate the Hacking Methods and its types.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Learn the methods in defending the attacks	Understand
CO2	Apply security concepts in OS and Networks	Apply
CO3	Discover knowledge in Intrusion detection and prevention systems	Analyze
CO4	Select about the Hacking Concepts	Analyze
CO5	Compare the Hacking Strategies in an Ethical manner	Evaluate

#### **Course Contents:**

#### INTRODUCTION TO CYBER SECURITY UNIT - I

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography - Web-User Side - Browser Attacks - Web Attacks Targeting Users -Obtaining User or Website Data - Email Attacks.

#### SECURITY IN OPERATING SYSTEM & NETWORKS UNIT - II

Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service -Distributed Denial-of-Service.

#### UNIT-III DEFENCES: SECURITY COUNTER MEASURES

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

#### UNIT - IV INTRODUCTION TO ETHICAL HACKING

Introduction-Ethical hacking Terminology-types of hacking technologies-phases of ethical hacking-Footprinting-Social Engineering-Scanning and enumeration.

#### UNIT – V SYSTEM HACKING

Understanding the password hacking techniques-Rootkits-Trojans-Backdoors-Viruses and worms-9 sniffers-denial of service-Session hijacking

Total: 45 periods

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## Text Books:

- 1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, "Security in Computing", 5th Edition Pearson Education, 2015.
- 2. George K.Kostopoulous, "Cyber Space and Cyber Security", CRC Press, 2013.

## **Reference Books:**

- 1. Martti Lehto, Pekka Neittaanmäki, "Cyber Security: Analytics, Technology and Automation" Springer International Publishing Switzerland, 2015
- 2. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Network Defense", CENGAGE Learning, 2<sup>nd</sup> Edition 2010.
- 3. Ankit Fadia "Ethical Hacking" Macmillan India Ltd, 2nd Edition 2006.

## Additional References:

- 1. https://onlinecourses.nptel.ac.in/noc22\_cs13/preview
- 2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs68/
- 3. https://nptel.ac.in/content/syllabus\_pdf/106105217.pdf

COs		Pos											PSOs	-	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	2
CO1	3	3	2		2	3	3		3	3	2	3		-	
CO2	3	2	2	2	3	2	2		3	3	2	2			
CO3	3	2	2		2				3	3	2			-	
CO4	3	3	2	2	3				3	3	2				
CO5	3	3	3	2	3				3	3	2			-	
	3	-51	High			2	P	Nedium	1		2		Low	200	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz		marks
Understand	Tutorial Class / Assignment	<u>S</u>	_
	Attendence	5	15
and the second second	Attendance	5	

	SL	Immative Asse	ssment	
Bloom's Category	Internal A	ssessment Exa	aminations	Terminal Examination
	IAE – I (7.5)	IAE - II (7.5)	IAE - III (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	20
Analyze				60
Evaluate				
Create				

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2005009			L	Т	Ρ	С
2000003	MOETIME DIA AND ANIMATION		3	0	0	3
Nature of Course	Open Elective	-				
Pre requisites	Computer Graphics and Multimedia	-				

#### **Course Objectives**

The course is intended to

- 1. Learn the basics and Fundamentals of Multimedia.
- 2. Introduce Multimedia components and Tools.
- 3. Understand how Multimedia graphics can be incorporated.
- 4. Differentiate the types of media format and their properties.
- 5. Choose the various multimedia components and operations.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Define what Multimedia is and how that works.	Understand
CO2	Understand multimedia components using various tools and techniques.	Understand
CO3	Analyze and interpret Multimedia data.	Apply
CO4	Discuss about different types of media format and their properties.	Analyze
CO5	Compare the right way of manipulating multimedia systems.	Evaluate

#### **Course Contents:**

## **UNIT - I MULTIMEDIA FUNDAMENTALS AND TOOLS**

Multimedia, Multimedia Objects, Multimedia in business and work, Multimedia hardware, Memory & Storage devices, Communication devices, Presentation tools, object generation which includes video sound; image capturing, Authoring tools, card and page based authoring tools.

## **UNIT-II SOUND/AUDIO**

Perception of sound, hearing sensitivity, frequency range, sound- wave length, the speed of sound. measuring the sound, musical sounds, noise signal, dynamic range, pitch, harmonics-equalization-reverberation time, Sound isolation and room acoustics- treatments- studio layout –room dimensions. The Basic set-up of recording system; The production chain and responsibilities. Microphones types - phantom power, noise, choosing the right mike; Mixing console; Input devices; Output devices; Audio Publishing

## **UNIT – III GRAPHICS / IMAGE**

Image file formats and how and where it is used, Principles of animation,2D and 3D animation, Morphing, Kinematics, tweening, Motion capture, character animation, modeling, special effects, and compositing, Video Conferencing, Web Streaming, Video Streaming, Internet Telephony - Virtual Reality - Artificial intelligence.

## UNIT – IV VIDEO

Different types of video camera including Handy Camera, Tape Formats, Analog Editing, Editing Equipment's and Consoles, Video Signal, Video Format, Video Lights - Types and Functions. Uses of Tripod-Types Clapboard-Usage. Light meter. Other Useful Accessories.

## **UNIT-V MOTION PICTURE**

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Analogue and Digital camera, About lenses-viewing and monitoring - ENG-EFP - Types of Films - various storage media - Types of lights - video lights - cine lights - reflectors - Digital Video Camera-

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Types Format-Major Components, Operation and Functions, Aperture Shutter. Focusing Methods. Focal Length, Depth of Field.

## Text Books:

## Total: 45 Periods

- 1. Tay Vaughan, "Multimedia: Making it Work", McGraw Hill Education, 9th Edition, 2014.
- 2. Ranjan Parekh, "Principles of Multimedia", McGraw Hill Education, 2nd Edition, 2013.

## Reference Books:

- 1. Prabhat k.Andleigh, Kiran Thakra, "Multimedia systems Design", PHI. Fifth Edition, 2015.
- 2. Ze- Nian Li and M. S. Drew, "Fundamental of Multimedia". Pearson Education, Second edition,
- 3. Ralf Steinmetz and Klara Nahrstedt, "Multimedia Computing, Communication and Applications",

## Additional References:

- 1. https://nptel.ac.in/courses/117/105/117105083/
- 2. https://www.youtube.com/watch?v=4GPyrj9vUZA
- 3. https://www.nptelvideos.com/computer\_graphics/

Cos						P	os			/		1		000	
	-1	2	3	4	5	6	7	8	0	101	4.4	10		PSOs	
CO1	3	2	2	2			1	0	3	10	- 11	12	1	2	3
202	3	3	2	2			-			1		1	3	3	3
CO3	3	2	2	2	1.1.7			-	-	-		1	3	3	3
204	2	1	1	4		-	-	-	3	-	-	1	3	3	3
205	0		1				-	5	-	-	+	1	3	3	3

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total
Remember	Online Quiz	marino	marks
Understand	Tutorial Class / Assignment	5	
	Attendance	5	15
	Attendance	5	-

	Summ	native Assessme	ent	
Bloom's Category	Intern	al Assessment E	Examinations	Final Examination
Remombor	IAE – I (7.5)	IAE II (7.5)	IAE - III (10)	(60)
Understand	10	10	10	20
Apply	30	30	30	60
Analyze	10	10	10	20
Evaluate				
Create				

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2005010		L	T	P	С
2003010	SAAYI KOOKAMMIIAO	3	0	3	
Nature of Course	Open Elective				
Pre requisites	Object Oriented Programming				

## **Course Objectives**

## The course is intended to

- 1. Teach principles of object oriented programming paradigm including abstraction, encapsulation, inheritance and polymorphism.
- 2. Impart fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- 3. Inculcate concepts of inheritance to create new classes from existing one & Design the classes needed given a problem specification.
- 4. Familiarize the concepts of packages and interfaces.
- 5. Facilitate students in handling exceptions and used in GUI.

## **Course Outcomes**

On successful completion of the course, students will be able to

CO.No.	Course Outcome	<b>Bloom's Level</b>
CO1.	Classify the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP like encapsulation, Inheritance and Polymorphism.	Understand
CO2.	Design and develop java programs, analyze, and interpret object oriented data and report results.	Apply
CO3.	Design an object oriented system, AWT components and multithreaded processes as per needs and specifications.	Apply
CO4.	Participate and succeed in competitive examinations like GATE, Engineering services, recruitment interviews etc	Apply
CO5.	Plan their career in java based technologies like HADOOP etc)	Apply

## **Course Contents:**

## UNIT - I JAVA BASICS

Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document.

## UNIT – II INHERITANCE AND POLYMORPHISM

Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword.

PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces. I / O STREAMS: Concepts of streams, Stream classes- Byte and Character stream, Reading console Input and Writing Console output, File Handling.

## UNIT - III EXCEPTION HANDLING

Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes.MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication.

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## UNIT - IV AWT CONTROLS

The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels - Scroll Pane, Menu, Scroll Bar. Working with Frame class, Colour, Fonts and layout managers. EVENT HANDLING: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes, Inner classes.

## UNIT-V SWINGS

9 Introduction to Swings, Hierarchy of swing components. Containers, Top level containers - JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JScrollPane. APPLETS: Life cycle of an Applet, Differences between Applets and Applications, Developing applets, simple applet.

#### **Total: 45 Periods**

#### Text Books:

- 1. Herbert schildt "The complete reference" Tata Mc Graw Hill, New Delhi 7th edition 2010.
- 2. T.Budd "An Introduction to Object Oriented Programming", Pearson Education, India 3rd Edition 2009.

## **Reference Books:**

- 1. Y. Daniel Liang "Introduction to Java programming", Pearson Education, Pearson education 7th edition 2010.
- 2. E Balagurusamy "Programming with Java", Tata McGraw Hill, Pearson education 7th edition 2010.
- 3. J. Nino, F. A. Hosch "An Introduction to programming and OO design using Java" John Wiley & sons, New Jersey, 2002.

## Additional References:

- 1. https://nptel.ac.in/courses/106/105/106105191/
- 2. https://onlinecourses.nptel.ac.in/noc22\_cs47/preview
- 3. https://onlinecourses.nptel.ac.in/noc21\_cs56/preview

Марр	ing of	Cours	e Out	comes	s (COs	) with Outc	Progra	amme (PSOs	Outco	mes (I	POs) P	rograr	nme S	pecifi	ic
Cos	Pos									PSOs					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1									3	1	1
CO2	3	2	2	1									3	1	
CO3	3	2	1	1			-			Part and			3	1	
CO4	3	3	2	1				1					3	1	
CO5	3	3	2	2									3	1	-
	3		Hi	gh	1	2		Med	lium		1		Lov	N	

	Formative assessment		
Bloom's Level	Assessment Component	Marks	Total marks
Apply	Classroom or Online Quiz	5	
Understand	Class Presentation/Power point presentation	5	15
	Attendance	5	

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The Concession

	Contin	Final			
Bloom's Category	IAE-I (7.5)	IAE-II (7.5)	IAE-III (10)	Examination	
Remember	10	10	10	(00)	
Understand	20	10	10	10	
Apply	20	20	20	40	
	20	20	20	50	
Evaluate	0	0		50	
Create		<u>U</u> U	0	0	
	0	0	0	0	

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