# Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)



# **Course Contents (Syllabus) for**

# Final Year B. Tech. (Information Technology) Sem – VII to VIII

# AY 2020-21

## **Professional Core (Theory)**

itle of the Course: Cryptography & Network Security 3IT		]		Р	Cr
01	3	1		-	4
re-Requisite Courses:					
Computer Networks					
extbooks:					
1. WilliamsStallings, "Cryptography and Network security I	Princip	les and I	Practic	ces",5 <sup>th</sup> e	dition,
Pearsom pub.					
eferences:					
1. Menezes, A. J., P. C. Van Oarschot, and S. A. V	/anstor	ne, "Hai	ndboo	k of A	pplied
Cryptography", 2 <sup>nd</sup> edition, CRC Press.					
2. Schneier, Bruce, "Applied Cryptography: Protocols & Alg	gorithn	ns", 2 <sup>na</sup> e	editior	ı, Wiley	Pub.
ourse Objectives :					
1. To describe the fundamental concepts of information	n syste	m secur	ity.		
2. To impart various Encryption techniques.					
3. To apprise security mechanisms and services against	threat	S.			
ourse Learning Outcomes:					
CO After the completion of the course the student should be abl	e Blo	oom's Co	ognitiv	ve	
to			5	•	
	lev	el	De	escriptor	
CO1 Generalize information security aspects and outline th	e 2		Ur	nderstan	ding
requirements.	-				0
CO2 Exploit and practice various encryption algorithms.	3		Ar	oplying	
CO3 Compare and verify appropriate security mechanisms and	d 4, 5	5		alyzing	,
authentication services.				aluating	
O-PO Mapping :					
a b c d e f g h i f	i k	1			
<b>CO1</b> 3 2 3 4					
<b>CO2</b> 2 3					
CO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1	3			
	1	5			
ssessment:					
wo components of In Semester Evaluation (ISE), One Mid Semes	ter Fy	aminati	ion (N	ASE) ar	nd one
nd Semester Examination (ESE) having 20%, 30% and 50% weigh			· · ·	(10L) u	
Assessment		Marks	very.		
ISE 1	1	10			
MSE		30			
ISE 2		10			
ESE		50			
ISE 1 and ISE 2 are based on assignment, oral, seminar, test (su	rprise/o		/auiz)	and g	roup
discussion.[One assessment tool per ISE. The assessment tool used for ISE	-		· / /	•	-
MSE: Assessment is based on 50% of course content (Normally first three					L
ESE: Assessment is based on 100% course content with70-80% weight			conte	nt (norn	nally
ast three modules) covered after MSE.	C			,	5
ourse Contents:					
Module 1				Hr	s.
Overview:				7	
				1	

Services, Mechanism and Attacks, The OSI security Architecture, A model for Network	
security.	
Classical Encryption techniques: Symmetric Cipher model, Substitution techniques, Transposition techniques, Steganography.	
	TT
Module 2	Hrs.
Block Cipher: Block cipher principles, The Data Encryption Standard, The strength of DES, Block Cipher Design Principles, The AES Cipher.	6
Module 3	Hrs.
Public Key Encryption and IntegrityPublic Key Cryptography: Principles of Public-Key Cryptosystem, RSA Algorithm,Key Management: Distribution of public Keys, Deffie-Hellman Key Exchange,Cryptographic hash functions, Message authentication code, Digital signature.	7
Module 4	Hrs.
Network SecurityPractice:	
Authentication Applications - Kerberos, X.509Certificates	6
Electronic Mail Security - Pretty Good Privacy, S/MIME,	
Module 5	Hrs.
IP & Web Security:	
IP security Overview, Architecture, Authentication Header, Encapsulating security Payload,	
Combining Security Associations, Key Management	7
WEB Security- Web Security Considerations, Secure Socket Layer and Transport Layer	
Security, Secure Electronic Transaction.	
Module 6	Hrs.
System security	
Intruders, Intruder Detection, Password Management, Viruses and Related Threats, Worms,	
Virus Countermeasures.	6
Firewall - Firewall Design Principles, Trusted systems	
Module wise Measurable Students Learning Outcomes :	
Module 1: Apply classical cryptographic techniques with knowledge of fundamental	concepts
of security.	1
Module 2: Test and compare block ciphers.	
Module 3: Experiment of different Public-Key Cryptography techniques.	
Module 4: Demonstrate the use of authentication protocols for network security.	
Module 5: Plan and setup of protocols for web security.	
Module 6: Discuss various measures to protect the system.	

	f the Course: Da	ata Min	ing 3	IT 4	02							]	Ĺ	Т		Р	Cr
			•								F		3	-		-	3
Pre-Re	quisite Courses	:															
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Textbo																	nd
	1. "Data M																310
	Edition,																
	2. "Data M		itrodu	ictory	/ and	l Ad	vano	ced	top	ICS	, M.	Н.	Dui	nham, 2	2 <sup>na</sup> E	dition,	
	Pearson, 3. "Data M		rootio	-1 M	achir	•• I /	oorn	ina	Та	-1a a	nd	Тас	hni	au	Ion	Witton	Fiho
	Frank an								100	518 2	ma	Tec		ques,	Ian	witten,	EIDE
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	1. "Data M	ining M	ethod	s · C	once	nts d	& Α	ppli	cati	ons	" R	aia	nCh	attamy	elli	Naros	a
	Publishi	-				-					,				•	,,	
	2. "Data M	•	-								om	etrio	cs",	Sushm	nitaN	Mitra,	
	TinkuAc	harya, V	NILE	Y Pu	blica	tion	, 20	03									
	3. "Data M	lining &	: War	ehou	sing'	', S.I	Prat	ohu,	N.	Ver	kat	esai	n, N	ew Ag	e Pı	ublishers	5,
	2010																
Course	e Objectives :							1				0					
	1. To introd															- 1-	
	2. To make				-					-					g to	01S.	
Course	3. To impate tearning Outo		ent ap	proa	mes	to na	anu			VOIT	u pi	001	ems	). 			
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	<b>P</b>						~		/								
														level		Descripto	or
CO1	To summarize	the bas	ic co	ncept	s, te	chni	ique	es ar	nd a	algo	rith	ms		2	Uı	nderstand	ling
	of Data Mining									U							
		a dife												3		Applyin	g
CO2	To develop, n			(sof	Ìwar	e) f	or	solv	ing	re	al 1	ifa					
CO2	techniques and		ithms	(501		•) -			$\mathcal{O}$	10	ui i	ne					
	techniques and problems.	d algori															
CO2 CO3	techniques and problems. To recognize r	d algori	rld pr	obler	ns, o									6		Creating	5
CO3	techniques and problems. To recognize t start independe	d algori	rld pr	obler	ns, o									6		Creating	5
CO3	techniques and problems. To recognize r	d algori	rld pr	obler	ns, o rch.	desig	gn s	olut	ion	to		ınd		6		Creating	5
CO3	techniques and problems. To recognize t start independe	d algori real wor ent study	rld pr and a	obler resear	ns, o								1	6		Creating	5
CO3	techniques and problems. To recognize t start independe	d algori real wor ont study	rld pr and a <b>a b</b> 1 2	obler resear	ns, o rch.	desig	gn s	olut	ion	to		ind k	1	6		Creating	2
CO3	techniques and problems. To recognize t start independe	d algori real wor ent study CO1 CO2	rld pr and a	obler resear	ns, o rch.	desig	gn s	olut	ion <u>h</u> 1	to		ınd	1 2	6		Creating	<u>,</u>
CO3	techniques and problems. To recognize t start independe	d algori real wor ont study CO1	rld pr and a <b>a b</b> 1 2	obler resear	ns, o rch.	desig	gn s	olut	ion	to		ind k	1	6		Creating	2
CO3	techniques and problems. To recognize a start independe Mapping :	d algori real wor ent study CO1 CO2	rld pr and a <b>a b</b> 1 2	obler resear	ns, o rch.	desig	gn s	olut	ion <u>h</u> 1	to		ind k	1	6		Creating	y 2
CO3 CO-PC	techniques and problems. To recognize a start independe Mapping :	d algori real wor ent study CO1 CO2 CO3	a     b       1     2       3	obler resear	ns, o rch.	e e 3	gn s	g	ion <ul> <li>h</li> <li>1</li> <li>2</li> </ul>	i	it a	k 2	1 2		n (N		
CO3 CO-PC Assessi Two co	techniques and problems. To recognize a start independe <b>Mapping :</b> <b>ment:</b> omponents of In mester Examinat	d algori real wor ent study CO1 CO2 CO3 Semester tion (ES	rld pr v and t a b 1 2 3 3 er Eva E) ha	obler resear c 2	ns, o rch. d	e e 3	gn s	g ne M	ion <ul> <li>h</li> <li>1</li> <li>2</li> </ul>	i Sem	it a	k 2 er H	1 2 Exar	ninatio	· · ·		
CO3 CO-PC Assessi Two co	techniques and problems. To recognize a start independe <b>Mapping :</b> <b>ment:</b> omponents of In mester Examinat	d algori real wor ent study CO1 CO2 CO3 Semester tion (ES sessment	rld pr v and t a b 1 2 3 3 er Eva E) ha	obler resear c 2	ns, o rch. d	e e 3	gn s	g ne M	ion <ul> <li>h</li> <li>1</li> <li>2</li> </ul>	i Sem	it a	k 2 er H	l 2 Exar res Ma	ninatio pective rks	· · ·		
CO3 CO-PC Assessi Two co	techniques and problems. To recognize a start independe <b>Mapping :</b> <b>ment:</b> omponents of In mester Examinat	d algori real wor ent study CO1 CO2 CO3 Semester tion (ES sessment ISE 1	rld pr v and t a b 1 2 3 3 er Eva E) ha	obler resear c 2	ns, o rch. d	e e 3	gn s	g ne M	ion <ul> <li>h</li> <li>1</li> <li>2</li> </ul>	i Sem	it a	k 2 er H	l 2 Exar e res Ma 1	ninatio pective rks 0	· · ·		
CO3 CO-PC Assessi Two co	techniques and problems. To recognize a start independe <b>Mapping :</b> <b>ment:</b> omponents of In mester Examinat	d algori real wor ent study CO1 CO2 CO3 Semester tion (ES sessment	rld pr v and t a b 1 2 3 3 er Eva E) ha	obler resear c 2	ns, o rch. d	e e 3	gn s	g ne M	ion <ul> <li>h</li> <li>1</li> <li>2</li> </ul>	i Sem	it a	k 2 er H	l 2 Exar e ress Ma 1 3	ninatio pective rks	· · ·		

ISE 1 and ISE 2 are based on assignment, oral, seminar, test (surprise/declared/quiz), and group discussion.[One assessment tool per ISE. The assessment tool used for ISE 1 shall not be used for ISE 2] MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:	
Module 1	Hrs.
<b>Introduction : Basic Concepts in Data Mining</b> Data mining background, classification of Data Mining, Data Mining Techniques. Data Preprocessing: Cleaning, Integration, Transformation, Reduction, Discretization, Data categories, supervised unsupervised learning, Fielded Applications, Data mining and ethics	7
Module 2	Hrs.
<b>Data Mining Primitives</b> Data Mining Primitives, Architecture of Data Mining, Knowledge representation <b>Concept Description:</b> Data generalization & summarization, analytical Characterization, mining class comparison, mining statistical measures in Databases.	7
Module 3	Hrs.
Association Rule mining, mining 1-dimensional & Multilevel Ass. Rulefrom transactional Database and Data Warehouse Association mining tocorrelation analysis, constraint based Association mining, Algorithms for association rules	6
Module 4	Hrs.
Classification & Prediction, Issues, Decision Tree, Bayesian classifier, Back propagation, Classification methods, Prediction, ensemble classification	6
Module 5	Hrs.
<b>Cluster analysis</b> Clustering, analysis, methods, (partitioning based, hierarchical based, density based, grid based, model based), similarity metrics, cluster validation techniques, clustering high dimensional data, constraint based cluster analysis, outlier analysis, applications	7
Module 6	Hrs.
Mining Complex Data sets Multidimensional analysis & descriptive mining of complex data types, mining spatial DB, Multimedia DB, Mining time series and sequential data, mining text datasets, web mining, data stream mining	6
Module wise Measurable Students Learning Outcomes :	
<ul> <li>Module 1: To understand data pre-processing to handle raw data having different anor Module 2: To grasp the fundamental knowledge of Data Mining Primitives and Archit Module 3: To understand frequent pattern mining and apply Association Rule mining different types of data sets.</li> <li>Module 4: To construct data mining solution for different Classification.</li> <li>Module 5: To analyse and validate clustering techniques.</li> </ul>	tecture.
Module 6: To find data mining solution to real life applications.	

		P	rofessional Core	(lah)				
Title of	f the C	Course: Open Source So		· · · ·	L	Т	Р	Cr
		ourser open source so		•	2		2	3
Pre-Re	quisit	e Courses:		I			1	
	•	Basic knowledge of O	perating Systems, (	Computer Net	work,	Softwar	e Engine	ering
		and free and open sour	ce tools and softwar	re's.			_	
Textbo	oks:							
	1.	r i r						
	2.	"Distributed Systems a						
	3.	1	ce Linux" by Richar	d L. Peterson	Tata N	1c-graw	Hill	
Refere	<b>n</b> 0061	Publication.						
Kelere	1.	"Introduction to Free S	oftware" <b>-</b> by SELF	project				
		Remy Card, Eric Duma	•		Cernel	Book"	Wilev	
		Publications, New Yor				,	,	
		Peter Wainwright, "Pro	ofessional Apache",					
		RasmusLerdorf and Le					lications,	,
	-	USA 2002.		11 D	r 11 - 0	T 11		
	5.	Wesley J Chun, "Core	Python Programmir	ng", Prentice H	all of	India, N	ew Delh	1,
Course	Ohio	2001.						
Course		To configure the open s	source software					
	2.	To contribute /develop		or open source	e envir	onment.		
		To use FOSS for softw						
Course	Lear	ning Outcomes:						
CO		the completion of the	e course the stude	nt should be	Bloc	m's Cog	gnitive	
	able	to			level		Descrip	otor
CO1		cise the FOSS tools in so	•	t	3		Applyi	
CO2		yze the economics of FC			4		Analyz	
CO3		e new FOSS or Contri onment.	bute to existing FC	JSS in FOSS	6		Creatin	g
CO-PC								
0-10	/ Map	a b c	d e f g	h i j	k	1		
		CO1 CO1				1		
		CO2	2	3				
		CO3	3			3		
Lab Ass		nt components of lab assessm	pont I A 1 I A 2 I A 2	and Lab ESE				
		is a separate head of passi		and Lab ESE				
Assess		Based on	Conducted by	Conduction	and	Mark	s Mark	KS .
			•	Submission				
LA1		Lab activities,	By Course	During week				
		attendance, journal	Faculty	submission at 5	the en	a of wee	к	
LA2		Lab activities,	By Course	During week	5 to	week	8 25	-
		attendance, journal	Faculty	submission at				
				8				
LA3		Lab activities,	By Course	During week	10 to	week 1	4 25	

	attendance, journal	Faculty		submission at the end of week	
Lab ESE	Lab performance and related documentation	By Faculty	Course		25
Week 1 indica	tes starting week of the sem	ester			
				ect, presentations, drawing, progra	mming an
	activities as per the nature o				
	ntal lab shall have typically	8-10 expe	riments		
Course Cont	tents:				
Module 1					Hrs.
Application	to open sources- Need	mmercial	aspects	Advantages of Open Sources- of Open source movement, D.	8
Module 2			,		Hrs.
	e development				
model, mod Introduction IRC, wiki, accessibility	els for FOSS- Cathedral r n to collaborative devel version control, bug trac v, documentation by doxy and creating software rep	nodel and opment (l king, hand gen). Soft	Bazaar n Develope Iling non ware pacl	Source software development nodel. r communities, mailing lists, -technical issues, localization, kage management (RPM, DEB tandards, Licensing and legal	10
Module 3					Hrs.
DHCP, DN Server, etc.		Web serv vebmin or	er, Ftp S usermin,	Server, E-mail Server, Telnet Installing and configuring of	8
	Experiment:		, í		
Mini Module	imum ten assignments sho			ove topics like: ions and their purpose with	
	<b>2:</b> Comparison of various	Onen So	urce tools		
	<b>3:</b> Excise the Open Source	-			
	4: Compilation and instal				
	5: Experimentation Of R				
				Develop a simple software for	
	c needs such as calculato				

itte of	the (	Course: So	ottware	1 est	ting	g & l	Qua	nty	Ana	iys	SIS L	ab	511	452	2		L 2	T 	P 2	$C_1$
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	1.	Desikan	, Ramesł	n, "S	Soft	ware	e Te	sting	g: pr	inci	iples	s an	d P	ract	ices	s", P	ear	son I	Educa	tion.
lefere	nces:		-																	
	1.	Marnei I	L Hutche	son	,"S	oftw	are	testi	ng fi	ınd	lame	enta	ls- ]	Met	hod	ls &	M	etrics	", Wi	iley
		Publicat	ion																	
	2.	Fenton,	Pfleeger	'Sot	ftwa	are N	Metr	ics:	A R	go	urou	is ai	nd p	orac	tica	l Ap	opro	oach'	, ,,	
			n Brooks	s/Co	ole,	ISB	N 98	81-24	40-3	85-	X									
ourse	e Obje	ectives :																		
	1.		duce fun								-	1.								
	2.		liarize tes								app	lica	tion	L						
	3.			ent s	offy	ware	e test	ing	tools	5.										
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			CO2	1							1	2		5	3					
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	sessme																			
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		is a separa		fpa	ssin						0							•	14	
Assess	ment	Based on	1			Coi	nduc	ted l	by			ıduo mis			an	d	Ma	rks	Mar	ks
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			e, journal		,	•	ulty					-				end c				
											5									
LA2		Lab		vitie	es,	By		C	Cours	e						to v			25	
		attendanc	ce, journal			Fac	ulty					miss	10n	at t	he e	end o	of w	veek		
LA3		es,	By		<u> </u>	Cours	P	8 Dur	ing	WA	ək	10 +	0.197	pel	14	25				
LAJ		Lab attendanc	e, journal		,		ulty	C	Jours		e During week 10 to week 1 submission at the end of wee								45	
			.,				• <u>j</u>				14									
	SE	Lab per	rformance	a	nd	By		C	Cours	e		ring	we	ek	15 t	0 W	reek	18	25	
Lab ES		1 1 4 1 1		ion		Fac	ulty				sub	miss	ion	at t	he e	end o	of w	veek		
Lab Es		related do	scumental	1011	l		any					mbb	1011			114 (	)1 VI	CON		
		tes starting					•				18		1011			iiu (	51 W	con		

The experimental lab shall have typically 8-10 experiments	
Course Contents:	
Module 1	Hrs.
Software Measurement	
Measurement in software engineering, Classifying software measures, applying the	6
framework, software measurement validation	
Module 2	Hrs.
Software Testing Process	
Purpose of testing, difference between inspection and testing, testing v/s debugging,	
testing life cycle, Roles and responsibility in testing, test artifacts, test plan, the V	7
model for testing, techniques, Metrics, Risk based testing, Test Automation, Types of	
testing, Testing-Black Box & White Box.	
Module 3	Hrs.
Software Testing tool's	
Need for Automated Testing tools, Taxonomy, Functional, Regression, Performance,	2
Test Management, Source Code Testing and How to select testing tools.	
Module 4	Hrs.
Study of testing tools	4
J-unit, Test director, Testuff, UFT and others.	
Module 5	Hrs.
Software Quality Assurance	
Ouality Concepts, Software Quality Assurance, Planning for SOA, Six Sigma	
Quality Concepts, Software Quality Assurance, Planning for SQA, Six Sigma Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance	6
Principles, Malcolm Baldridge Assessment ISO 9000, Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics,	6 Hou
Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance	
Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance Laboratory Content	
Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance Laboratory Content 1. Code Test	
Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance Laboratory Content 1. Code Test a. Write programs in "Language to demonstrate the working of the following.	Hou
Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance Laboratory Content 1. Code Test a. Write programs in "Language to demonstrate the working of the following. constructs: i) dowhile ii) whiledo iii) ifelse iv) switch v) for	Hou
<ul> <li>Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance</li> <li>Laboratory Content <ol> <li>Code Test</li> <li>Write programs in "Language to demonstrate the working of the following. constructs: i) dowhile ii) whiledo iii) ifelse iv) switch v) for</li> <li>A program written in "Language for Matrix Multiplication fails Introspect the causes for its failure and write down the possible reasons for its failure</li> <li>Take any system (e.g. ATM system) and study its system specifications and</li> </ol> </li> </ul>	Hou
<ul> <li>Principles, Malcolm Baldridge Assessment ISO 9000,Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Software Maintenance</li> <li>Laboratory Content <ol> <li>Code Test</li> <li>Write programs in "Language to demonstrate the working of the following. constructs: i) dowhile ii) whiledo iii) ifelse iv) switch v) for</li> <li>A program written in "Language for Matrix Multiplication fails Introspect the causes for its failure and write down the possible reasons for its failure</li> </ol> </li> </ul>	Hou
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	related documentation	Faculty		submission at the end of week	
		-		18	

Week 1 indicates starting week of the semester

Lab activities shall include performing experiments, mini-project, presentations, drawing, programming and other suitable activities as per the nature of lab course.

The experimental lab shall have typically 8-10 experiments

### **Course Contents:**

Programming assignments based on following broad topics :

- 1. Perform data pre-processing tasks.
- 2. Implement and carryout association rule analysis.
- 3. Implement similarity measures, Correlation coefficient measures, regressions and statistical measures for any dataset and analyze the results.
- 4. Implement various clustering algorithms.
- 5. Implement various classification algorithms.
- 6. Perform various data mining tasks using WEKA and KNIME API.
- 7. Perform data transformations using an ETL Tools.
- 8. Perform advance data mining tasks on text, spatial and image dataset.
- 9. A small case study involving all stages of KDD. (Datasets are available online like UCI Repository etc.)
- 10. Using some sample data sets implement and test data mining techniques.

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programming and other suitable activities as per the nature of lab course.

Project/Mini-project is to be carried out in a group of maximum 3 to 5 students. Each group will carry out Project/mini-project on developing any application software based on following areas.

- SCI or scopus index journal paper based topic.
   Society /Industry Problem Statement( Sponsored Project)
   Problem statements based on current or previously learned Technology.

## **Open Elective (OE)** (List OE (MOOC/NPTEL) will be published per semester/year)

## **Professional Electives IV**

Title	of the	Course: Pr	ofe	ssion	nal	Eleo	ctives	s I	V:	Higl	h	L	Т		Р	Cr
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	3. To (	devise various	par	allel	algo	rithm	s for 1	matri	ces	and g	raph	ns.				
Course		<b>Outcomes:</b>														
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`	•	e modules) co	vere	d afte	er M	ISE.										
Course	e Contents:															

Module 1	Hrs.
Introduction	
What is parallel computing? The scope of parallel computing? Issues in parallel	
computing. Taxonomy of parallel architecture, Dynamic interconnection networks,	7
static interconnection networks, Routing mechanism for static network. Communication	
cost in static interconnection network.	
Module 2	Hrs.
Parallel programming models and paradigms.	
Introduction, A cluster computer and architecture, parallel applications and	
development, code granularity and level of parallelism, parallel programming models	7
and tools, methodical design of parallel algorithm, parallel program paradigm,	
programming skeleton and templates.	
Module 3	Hrs.
Performance and scalability of parallel systems	111.3.
Performance Metrics for parallel systems. The effect of Granularity and Data Mapping	
on Performance. The Scalability of parallel systems, ISOefficiency metric of scalability,	6
sources of parallel overhead, Minimum execution time and minimum cost-optimal	U
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execution time.	<b>II</b>
Module 4	Hrs.
Tools for parallel programming	
OpenMP, MPI, CUDA/OpenCL, Chapel, etc., Thread basics, Work Sharing constructs,	
Scheduling, Reduction, Mutual Exclusion Synchronization & Barriers, The MPI	6
Programming Model, MPI Basics, Global Operations , Asynchronous	
Communication, Modularity, Other MPI Features, Performance Issues	
Module 5	Hrs.
Hybid parallelism and accelerators.	
MPI + CUDA, Basic of GPGPU, CUDA Programming model, CUDA memory type,	6
CUDA and/or OpenCL for GPGPU hardware, case study.	
Module 6	Hrs.
Algorithms	7
Dense matrix algorithms, sorting, graph algorithms.	/
Module wise Measurable Students Learning Outcomes :	
Module 1: Module 1: Understand basics of parallel computing platform.	
Module 2: Module 2: Comprehension of parallel algorithm design methodology.	
Module 3: Module 3: Computing performance of parallel algorithm.	
Module 4: Module 4: Classify various programming tools.	
Module 5: Module 5: Explain CUDA Memory model and Architecture.	
Module 6: Module 6: Design of parallel algorithm for different data structures.	
Futorial Content:	
utorial can be conducted as12 Assignments based on module 1 to 6.	

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Pre-Requisite Courses	:															
Wireless		5														
Textbooks:																
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2. KazemSo											•					
Protocols	•						,	,					,	,		
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2. C.S.Rag	nvendra	Kr	rishr	na M	[ Si	valir	ngam&	Taie	ebZa	anati	"\	Wire	eless	senso	r	
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3. Samuel I	· •	-		Rrah	eaul	&Ev	engelo	sKr	anak	ris	"Ac	1-H	oc N	Mohile	and	
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sensor network a	* *		- 4 -	1	- 6 1	<u> </u>	10				5			Err	Justino	
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Module 1	Hrs.
Introduction to Wireless Networks	
Evolutions of mobile cellular network, GSM, GPRS, Ad-hoc Packet radio network: Architecture of PRNET, Routing in PRNET, Route calculation.	7
Module 2	Hrs.
Ad-hoc wireless media access protocol Problem in ad-hoc channel access, sender initiated and receiver initiated MAC protocol, Existing Ad-hoc MAC protocol: MACA, MACA-BI, PA-MAS, DBTMA, MARCH.	6
Module 3	Hrs.
Ad-hoc routing protocol Table Driven Approach: DSDV, CGSR; On Demand Approach: AODV, DSR; Hybrid: Zone Routing Protocol.	6
Module 4	Hrs.
Associativity Based Long Lived Routing Protocol ABR Protocol Description: Route Discovery phase, Route reconstruction phase, Alternate route, Route Deletion phase, ABR header and tables; Implementing ABR routing function; Experiment and protocol performance.	7
Module 5	Hrs.
Ad-hoc Multicast Routing	
Multicasting in wired network, multicast routing in mobile Ad-hoc network, DVMRP, AODV multicast, CAMP, ODMRP.	7
Module 6	Hrs.
<b>Wireless Sensor Network</b> Introduction and overview of wireless sensor network, Application of wireless sensor network, Architecture of wireless sensor network, Routing protocol for wireless sensor network, Transport control protocol for wireless sensor network.	6
Module wise Measurable Students Learning Outcomes :	
Module 1:Describe wireless TechnologiesModule 2:Understand different adhoc network protocolModule 3:Classify different routing protocol for MANSModule 4:Compare different multicast routing protocolModule 5:Evaluate wireless Sensor Networks protocolsModule 6:Apply different WSN scenarios to solve engineering problems	
Futorial Content:	
Futorial can be conducted as12 Assignments based on module 1 to 6.	

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Assessment Marks

End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

ISE 1	10	
MSE	30	
ISE 2	10	
ESE	50	
ISE 1 and ISE 2 are based on assignment/decla	red test/quiz/seminar etc.	
MSE: Assessment is based on 50% of course c		
	ontent with 60-70% weightage for course conte	nt
(normally last three modules) covered after MS	SE.	
Course Contents:		
Module 1 : Fundametals of Neural Network		Hrs.
McCulloch Pitts Neuron, Thresholding Logic, Multilayer Perceptrons (MLPs), Representation Descent, Feedforward Neural Networks, Re Networks. Back-propagation algorithm.	n Power of MLPs, Sigmoid Neurons, Gradient	7
Module 2: Optimizations in Gradient Descen	nt	Hr
Gradient Descent (GD), Momentum Based G AdaGrad, RMSProp, Adam, Bais correction in	D, Nesterov Accelerated GD, Stochastic GD,	6
Module 3: Regularization		Hr
Regularization: Bias Variance Tradeoff, I	2 regularization, Early stopping, Dataset	
augmentation, Parameter sharing and tying,	Injecting noise at input, Ensemble methods,	7
Dropout. Greedy Layer wise Pre-training, initialization methods, Batch Normalization.	Better activation functions, Better weight	,
Module 4:Deep Learning for Natural Langu	ingo Progossing	Hrs.
Principal Component Analysis and its inte		111 5.
	s: One hot representation of words, SVD for	6
learning word representation, Continues bag of	_	U
		Hrs.
Module 5:Deep Learning for Computer Visi		пrs.
Convolutional Neural Networks, LeNet, Alex Object Localization, Object Detection using Windows, Bounding Box Predictions, Inters Anchor Boxes, YOLO Algorithm, Region Prop	g Convolutional Implementation of Sliding section Over Union, Non-max Suppression,	7
Module 6:Recurrent Neural Networks		Hrs.
Recurrent Neural Networks, Back propaga Exploding Gradients, Truncated BPTT, GRU, Mechanism, Attention over images.		7
Module wise Measurable Students Learning	Outcomes:	
Module 1: To understand the basics of Neur Module 2: To be able to optimize the basic Module 3: To report regularization techniqu Module 4: To appreciate the Deep Learning Module 5: To study modern Computer Visio	Gradient Descent algorithm. le in Deep Learning. for Natural Language Processing problem.	

Title o	of the Course:	Profe	essio	ona	I E	lect	ives	IV	′:	Dig	ital	I	ma	ge	L	Т	Р	Cr
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	<b>Pre-Requisite Courses :</b> Data Structure, Mathematics (Matrices), Any programming language like C																	
	Textbooks:																	
<ol> <li>Gonzalez ,woods"Digital Image Processing" , pearson education Second Edition.</li> <li>S.Ananddurai, "Fundamentals of digital Image Processing" ,Pearson Edition.</li> </ol>																		
Ref	erences:																	
1	<ol> <li>Milan Sonka,"Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition</li> <li>S.Jayaraman,T.Veeerkumar,"Digital Image Processing",MGH</li> </ol>										L							
Course	<b>Objectives</b> :																	
	<ol> <li>To introduce</li> <li>To develop s understandin</li> <li>To encourage</li> <li>Learning Outco</li> <li>After the com</li> <li>be able to</li> </ol>	kills of leng of the ang of the e to appl omes:	earı toc y ir	ners ols ı nag	s to isec ge p	dev l in roce	elop Ima essir	o en ige i ng a	lgin Pro 1go	eer cess rith	ing sing ms	ski 5. to	ills rea	and 1 pi	d intu roblen		ive	
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		CO2 CO3				-	3							1	-			

### Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
FSF	50

ISE 1 and ISE 2 are based on assignment, oral, seminar, test (surprise/declared/quiz), and group discussion.[One assessment tool per ISE. The assessment tool used for ISE 1 shall not be used for ISE 2]

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with70-80% weightage for course content (normally last three modules) covered after MSE.

### **Course Content :**

Module 1	Hrs.
<b>Introduction:</b> Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image.	7
Module 2 :Image Convolution & Correlation	Hrs
Computation of 2D Convolution & correlation through Graphical methods, Determination of 2D convolution and correlation through Matrix methods, Significance of 2D convolution.	7
Module 3	Hrs.
<b>Image Enhancement In Frequency Domain:</b> Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.	6
Module 4	Hrs.
<b>Image Restoration:</b> A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms.	6
Module 5	Hrs.

Image Compression: Introduction, coding Redundancy, Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.	6
Module 6	Hrs.
<b>Image Segmentation:</b> Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.	7
Module wise Measurable Students Learning Outcomes :	
Module 1: Able to identify and represent suitable data structure for image. Module 2: Apply different image preprocessing and filtering techniques to enhance the image	quality.
	1 5
Module 3: Apply image transforming techniques.	
Module 4: Apply image enhancement and restoration techniques.	
Module 5: Know different techniques for image compression.	
Module 6: To extract features in the image using segmentation techniques.	
Tutorial Content:	
Tutorial can be conducted as12 Assignments based on module 1 to 6.	

Title o	f the Course:	Profess	sion	al	Elec	ctive	s IV	V :S	oft	war	e D	efir	ned	Network	κ L	Т	Р	Cr
3IT 415															2	1	-	3
Pre-Re	quisite Course	es: Comp	uter	and	d wi	reles	ss ne	etwo	ork									
Textbooks:																		
	<ol> <li>Chuk Black, Timothy Culver "Software Defined Networks: A Comprehensive Approach", 2<sup>nd</sup> Edition, Wiley publication, 2016.</li> <li>James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson Publication.</li> </ol>																	
References:																		
<ol> <li>Thomas D. Nadeau, "Software Defined Networks, An Authoritative Review of Network Programmability Technologies", Ken Gray Publisher, August 2013, ISBN: 978-1-4493- 4230-2.</li> <li>Behrouz A. Forouzan, "Data Communication and Networking" TMGH 4th edition.</li> </ol>												493-						
Course	Objectives :													•				
Course		tcomes:	ne ne	etwo	ork	adm	inist	ratio	on ti	hrou				zation an Bloom's	-			
	able to													Level	Des	crip	tor	
CO1	Comprehend control plane		ept	of	abs	tract	ing	and	ce	ntra	liziı	ng t	he	2	Unc	lerst	and	ing
CO2	Analyze the in architectures t	mplicatio	ons	of s	shift	ting	fron	n tra	aditi	ona	l ne	etwo	ork	4	Ana	lyzi	ing	
CO3	Evaluate the n	etwork v	virtu	aliz	atio	nfur	nctio	ns.						5	Eva	luat	ing	
CO-PC	Mapping :																	
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		CO3	2											1				
Assessi	nents :																	
Teache	er Assessment:																	

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one

End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

### **Course Contents:**

Module1: Basic Networking Device and SDN	Hrs.
Basic Packet Switching Terminology, Historical Background, The Modern Data Center,	
Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables, Packet	7
Forwarding IQ.	
Module2: Introduction to SDN	Hrs.
SDN Implications: Research and Innovation, Cost, Industry, Data Center Innovation,	
Data Center Needs, Real Time Case Study of Data Center, Virtualization, Network	7
Virtualization, Network Function Virtualization	
Module3: Open Flow Protocol and SDN	Hrs.
OpenFlow: Flow Table structure, Flowtable Actions, Flow messages, Legacy	6
Mechanisms Evolve Toward SDN, SDN Applications, Alternate SDN Methods.	6
Module4: SDN in Data Center	Hrs.
Data Center Definition, Data Center Demands, Tunneling Technologies for the Data	
Center, Path Technologies in the Data Center, Ethernet Fabrics in the Data Center, SDN	
Use Cases in the Data Center, Open SDN versus Overlays in the Data Center, Real-	6
World Data Center Implementations.	U
Module5: SDN in Other Environments	Hrs.
Consistent Policy Configuration, Global Network View, 8.1 Wide Area Networks,	
Service Provider and Carrier Networks, Campus Networks, Hospitality Networks,	
Mobile Networks, In-Line Network Functions, Optical Networks, SDN vs. P2P/Overlay	7
Networks.	

Module 6: : Network Function Virtualization	Hrs.
Existing Network Virtualization Framework (VMWare and others), Mininet based	6
examples, Virtualization and Data Plane I/O, Services Engineered Path.	U
Module wise Measurable Students Learning Outcomes :	
After the completion of the course the student should be able to:	
Module 1: Understand the origin of SDN and medium of access.	
Module 2: Comprehend the control plane and data plane structure of SDN.	
Module 3: Analyze the SDN operation in smart network.	
Module 4: Scrutinize the SDN in Data Center and web applications.	
Module 5: Examine various standards of SDN in real-time environment.	
Module 6: Design the network function for virtualization	
Tutorial Content:	
Tutorial can be conducted as12 Assignments based on module 1 to 6.	

# **Syllabus for Final Year IT SEM VIII**

### **Professional Core (Lab)**

	Course: Pro	ject II 3ľ	Г 49	2						Ι			Т		Р	C
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Pre-Requisit	te Courses:	-								· · · · · ·						
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Course Obje	ectives :															
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Course Lear	ning Outco	mes:														
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Note: Project –I continued in this semester.

Project/Mini-project is to be carried out in a group of maximum 3 to 5 students.

Each group will carry out Project/mini-project on developing any application software based on following areas.

4. SCI or scopus index journal paper based topic.

- 5. Society /Industry Problem Statement( Sponsored Project)
- 6. Problem statements based on current or previously learned Technology.

Project group should submit workable project at the end of second semester.

Project report (pre-defined template) should be prepared using Latex/Word and submitted along with soft copy on CD/DVD (with code, PPT, PDF, Text report document & reference material) or on online github.

Students should maintain a project log book containing weekly progress of the project.

Title of the Course: Techno-Socio Outreach 3 IT493	L	Т	Р	Cr
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#### Pre-Requisite Courses: --

**References:** The students may refer/undergo: Online open source courses, social services, club activity, sport activities, team activity and industry interaction

### **Course Objectives :**

- 1. To propose a structured and rational solution to address the relevant skills
- 2. To motivate students towards the desirous need of industry, economy and society
- 3. To provide opportunity to integrate IT based solutions with various enterprises

### **Course Learning Outcomes:**

CO	After the completion of the course the student should be able to	Bloom's	Cognitive
		level	Descriptor
CO1	Engage the programme for welfare of society and environment	3	Applying
CO2	Appraise pragmatic skills for national and international competitions	4	Analyzing,
CO3	Recommend and propose engineering solution for industry and community	5, 6	Evaluating Creating

### **CO-PO Mapping :**

	a	b	с	d	e	f	g	h	i	j	k	l
CO1							3			2		
CO2					3						2	
CO3						2		1				3

#### Assessments :

#### **Teacher Assessment:**

Student will be assessed based on defined parameters/ rubrics at the department. The assessment rubrics will be shared to students well in advance. The performance and progress will be assessed occasionally by the department mentors/panel. However, the final gradation will be carried out in  $8^{th}$  semester based on the cumulative performance over eight semesters.

### **Course Contents:**

Student can undertake any techno-socio activity as listed below but not limited to:

- 1. Each student or group of students may work for the welfare of the environment, society through programmes such as tree plantation, blood donation campaigns etc.
- 2. Each student or group of students participating in technical events/competition/exhibition.
- 3. Certification of the MOOC courses (beyond syllabus) / Programming competition/ interaction with industry
- 4. Developing any innovative gadget / solution / system and technology transfer in the interest of Nation / Society / Institute (WCE)
- 5. Publishing papers /articles in national / international conferences / journals or similar contributions
- 6. Coordinating students' clubs / services like SAIT/WLUG/Lab administration or any other
- 7. Organizing techno-socio activity for the students / community in rural areas, unprivileged areas

### **Professional Elective V**

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Textbooks:																	
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2. Gol	ldberg, D	David E	E, " <b>(</b>	Gen	etic	Alg	gorit	hm	ns ir	n Se	arc	h, (	Opt	imiz	ation a	nd Mao	chine
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Edi	ition., 20	08.															
<b>References:</b>																	
1. Tin	nothy J. I	Ross, "	'Fuz	zzy	Log	gic v	vith	En	gin	eeri	ng	Ap	plic	atio	n", Tata	a McG	raw Hill,
	w Delhi,			2					C		U						, ,
2. Rol	bert J Scl	halkff,	"Aı	rtifi	cial	Ne	ural	Ne	two	orks	", N	Ac(	Gra	wН	ill, Nev	v Delhi	i, 1997.
3. Siv	anandam	n S N a	nd 1	Dee	pa	S N	," In	tro	duc	tion	to	Ge	enet	ic al	lgorithn	ns ", Sj	pringer
Ver	lag, Hei	delberg	g, 20	008											-	-	
<b>Course Objective</b>	s :	•															
1. To	introduc	e vario	us o	com	por	nent	of s	oft	col	npu	tin	g.					
													ing	and	optimiz	zation	problems.
3. To	familiari	ize witl	h th	e sv	varr	n in	telli	gei	nce	met	hoo	ds.	-		-	-	-
<b>Course Learning</b>	Outcom	ies:															
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CO1 Classify ha	rd and so	oft com	outir	ng c	once	epts								3		Und	lerstanding
CO2 Compare th							e me	thc	ods.					4			lyzing
CO3 Justify the										1.				5			luate
<b>CO-PO Mapping</b>	:																
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	MS														30		
	ISE														10		
	ES														50		
ISE 1 and ISE 2 a																ind grou	up discussion
assessment tool per	r ISE. Th	e assess	sme	nt to	ol u	ised	tor I	SE	S	hall	not	be	use	d for	[ISE 2]		
MSE: Assessment ESE: Assessment																antant (	normally les
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Course Contents:																	
	•																II
Module 1																	Hrs.

Introduction	
History, Scope of Soft Computing, components of Soft Computing- Neural Networks,	5
Application scope of ANN, Fuzzy Logic, Genetic algorithm, Swarm Intelligence, Hybrid	5
System, Hard vs. Soft Computing.	
Module 2	Hrs.
Artificial neural network (ANN)	
Fundamental Concept, Evolution of Neural network, Basic models of ANN, important	
terminologies of ANN, Mc-Culloch Pitts Neuron, Linear separability, AND, OR, EXOR	7
problem solving by ANN, Supervised Learning, Unsupervised Learning, Application to ANN to	
real world problem.	II
Module 3	Hrs.
Genetic algorithms (GA)	
Introduction, basic operators and Terminologies in GA, Genetic operators – Selection, cross- over, reproduction and mutation – fitness function, traditional vs. Genetic algorithm, simple	7
genetic algorithm, general genetic algorithm, the schema theorem, classification of GA, Genetic	/
programming. Application to GA to real world problem.	
Module 4	Hrs.
Introduction to classical set and fuzzy sets	111.5.
Introduction, Classical set (crisp set) Fuzzy sets and their properties, Fuzzy models,	6
Membership function, Defuzzification. Application to Fuzzy logic to real world problem.	Ū
Module 5	Hrs.
Swarm intelligence (SI)	
Ant colony optimization (ACO). Swarm as a multi-agent system, Distributed coordination and	
group communication, Particle Swarm Optimization (PSO), Differential Evolution (DE),	8
Harmony search (HS), Bacteria Foraging Optimization (BFO), Artificial Bee Colony algorithm	0
(ABC), Biogeography-Based Optimization (BBO), Gravitational Search Algorithm (GSA),	
Grenade Explosion Method (GEM) Teaching Learning Based Optimization Algorithm (TLBO).	
Module 6	Hrs.
Applications of soft computing	
Hybrid System, Applications in image processing, optimization of TSP using GA/ANN, GA	(
based Internet search technique, soft computing based hybrid fuzzy controller, Application of soft computing in multiple disciplines. Top research article in soft computing from high reputed	6
journals.	
Module wise Measurable Students Learning Outcomes :	
Module 1: To differentiate between hard and soft computing.	
Module 2: To study the fundamental concept ANN.	
Module 2: To study the fundamental concept AIVI. Module 3: To recognize basic operators and Terminologies in GA.	
Module 4: To know fundamental like Classical set (crisp set) Fuzzy sets and their prop	ortion
Module 4: To know fundamental fike Classical set (crisp set) Fuzzy sets and then proposed Module 5: To know swarm intelligent algorithm: ACO, PSO, DE, HS, BFO, ABC, BB	
GEM, TLBO.	0, USA,
Module 6: To understand the Hybrid System of soft computing.	
Tutorial Content:	
Tutorial can be conducted as 12 Assignments based on module 1 to 6.	

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Refere	nces:																	
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	2. "Geogr															, Kei	ith C. Cl	larke,
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Module 2	Hrs.
<b>Database Management and Data Editing</b> Database Approach, Attribute Data in GIS, Relational Model, Attribute Data Entry, Manipulation of Fields and Attribute Data, GIS Database Applications, Web GIS, Developments in Databases, Data Input and Editing, Methods of Data Input, Data Editing, Integrated Database.	7
Module 3	Hrs.
<b>Data Analysis</b> Measurements in GIS-Lengths, Perimeters, and Areas, Queries, Reclassification, Buffering and Neighbourhood Functions, Map Overlay, Spatial Interpolation, Analysis of Surfaces, Network Analysis.	6
Module 4	Hrs.
Modelling and Output Analytical Modelling in GIS, Modelling Physical and Environmental Processes, Modelling Human processes, Modelling the Decision-Making Process, Output: from New Maps to Enhanced Decisions, Maps as Output, Non-Cartographic Output, Spatial Multimedia, Mechanisms of Delivery, GIS and Spatial Decision Support.	8
Module 5	Hrs.
<b>Data Quality</b> Data Quality Issues, Describing Data Quality and Errors, Sources of Errors in GIS, Finding and Modelling Errors in GIS, Managing GIS Error.	5
Module 6	Hrs.
GIS Project Management GIS Project Design and Management, Problem Identification, Designing a Data Model, Project Management, Implementation Problems, Project Evaluation.	5
<ul> <li>Module wise Measurable Students Learning Outcomes :</li> <li>Module 1: Understand Fundamentals of GIS, Spatial data modelling.</li> <li>Module 2: Understand relational database design for spatial and non-spatial data model</li> <li>Module 3: Relate different measures of GIS.</li> <li>Module 4: Apply data modelling for spatial decision support in GIS application</li> <li>Module 5: Classify different data quality issues in context of GIS.</li> <li>Module 6: Design GIS application through standard software engineering model</li> </ul>	ling.

Title of the C 3IT433	Course: Pro	fessiona	l Elec	tive	V: I	Busi	iness l	ntel	ligeı	ıce	L 2	T 1		Р	Cr 3
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Introduction t	o OLTP and	ULAP (N	IOLA	r, R(	JLA	r, F	IULA	r)							

Module 2	Hrs.
Basics of BI	
BI Definitions & Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI	7
Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business	,
Applications of BI, BI best practices	
Module 3	Hrs.
Data Integration	(
Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data –types and sources.	6
Module 4	Hrs.
Data Processing	Ш5.
Introduction to data quality, data profiling concepts and applications, introduction to ETL	6
(Extract-Trensform-Loading) using Open Source Software.	U
Module 5	Hrs.
Data and Dimension Modeling	111.50
Introduction, ER Modeling, multidimensional data modeling, concepts of dimensional, facts,	-
cubes, attribute, hierarchies, star and snowflake schema, Introduction to business metrics and	7
KPLs, creating OLAP using Application Software.	
Module 6	Hrs.
Basic of Enterprise Reporting	
A typical enterprise, Malcolm Baldrige – quality performance framework, balanced scorecard,	7
enterprise dashboard, balanced scorecard vs. enterprise dashboard, enterprise reporting using	1
software tools, best practices in the design of enterprise dashboards.	
Module wise Measurable Students Learning Outcomes :	
Module 1: Differentiate between digital data and its types.	
Module 2: Understand fundamentals of BI Process, Technology, Roles and Application	IS.
Module 3: Perform data integration through various approaches.	
Module 4: Understand high quality data with data profiling concepts.	
Module 5: Perform different data modelling for efficient handling of data.	
Module 6: Do enterprise reporting using various methods.	
Tutorial Content:	
Tutorial can be conducted as12 Assignments based on module 1 to 6.	

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	ional Animation, ating articulated str													ion s	speen	icatio	ш,	U	

Module 3	Hrs.						
The OpenGL							
OpenGL Architecture, OpenGL API, primitives and attributes, First program in OpenGL,							
Drawing lines and shapes in OpenGL.							
Module 4							
Geometric Objects & Transformations							
Scalars, points and Vectors, Three-dimensional primitives, coordinate systems, OpenGL							
transformation Translation, scaling, Rotation. Composition of Transformation.							
Module 5	Hrs.						
Lighting and surfacing							
Light and matter, the phong lighting model; computation of vectors; polygon shading;							
Approximation of sphere by recursive subdivision; Light sources in OpenGL; Specification of	6						
material in OpenGL.							
Module 6	Hrs.						
Rendering	6						
Display Lists, Texture mapping, Photon mapping, Radiosity, Ray Tracing, global illumination,							
shading of surfaces							
Module wise Measurable Students Learning Outcomes :							
Module 1: To explain how images are represented during processing and identify princ	iples of						
3-D modelling							
Module 2: To apply different animation techniques using different animation structures							
Module 3: To design and construct 3-D graphics applications program using OpenGL							
Module 4: To apply the relevant mathematics of computer graphics.							
Module 5: To apply lighting effect to the scene.							
Module 6: To summarize the rendering pipeline architecture							
Tutorial Content:							

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3.	PankajJalote, "A Edition.	An Integr	ated	App	roach	to So	oftwa	re Engine	eri	ng", Nar	osa Puł	olication,	3rd
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	able to									level	Ľ	Descriptor	
CO1	Apprehend th time applicati	the software design architecture for real tion							2	U	Inderstand	ling	
CO2								life	3	A	pplying		
CO3	Evaluate and respectively.	econstruc	et so	oftwa	re are	chited	ture	for real-t	ime	5	E	valuating	
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		CO2	1			2							
		CO3		3						2			
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and responsibility of architect, levels of architecture, 4 + 1 Architecture view, Examples						
of Software Architecture	Hrs.					
Module 2: Quality Attributes & Software Architecture						
Quality attributes, Quality requirements, Architecture in life cycle, Designing the						
Architecture, Forming team structure, Creating Skeleton System.						
Module 3: Design Patterns						
Creational design patterns, Structural design patterns, behavioral patterns, concurrency						
pattern, uses of design patterns.	6					
Module 4: Documenting software architecture	Hrs.					
Documentation of design patterns, Documenting Software Architecture Stakeholders,						
Views, View sets, View-based documentation.	6					
Module 5: Software Architectures Reconstruction						
Architecture Evaluation, Architecture Recovery Objectives, Information Extraction,						
Database Construction, View Fusion, Architecture Reconstruction, Analyzing	6					
Architectures.						
Module 6: Software Architecture Standards and Applications						
IEEE 1471, ISO 42010, Architecture Knowledge Management, Product line						
architectures, Enterprise Architecture.	7					
Module wise Measurable Students Learning Outcomes :						
After the completion of the course the student should be able to:						
Module 1: Understand the software project frame works and team activity.						
Module 2: Comprehend the software design for real-time applications.						
Module 3: Analyze the software architecture in industry domain.						
Module 4: Scrutinize the documentation of software architecture.						
Module 5: Examine software architecture in real-time environment.						
Module 6: Design the model of software design						
Tutorial Content:						
Tutorial can be conducted as 12 Assignments based on module 1 to 6.						