

## Metric No. 1.1.1 \*

## Mukesh Patel School of Technology Management and Engineering

### Vision

Play a distinct role in providing excellence in engineering and technology management education thereby creating human resources of value to industry and society both at national and international level.

### Mission

- 1. Formulate relevant curriculum through strong industry linkages and interaction.
- 2. Ensure quality of education through pedagogical innovations
- 3. Undertake and promote relevant research
- 4. Ensure multifaceted development of students, faculty and staff through continuous introspection and inputs.
- 5. Set up the international linkages with Institutes /industry of repute

**Program Outcomes** (common to all programs)

PO-1 Engineering Knowledge: Graduates should demonstrate a solid understanding of engineering principles, mathematics, and relevant scientific disciplines.

PO-2 Problem Analysis: They should be able to analyze complex engineering problems and formulate solutions using fundamental principles.

PO-3 Design/Development of Solutions: Graduates should be capable of designing and developing solutions that meet specific requirements while considering societal, environmental, and economic factors.

PO-4 Conduct Investigations of Complex Problems: They should be able to conduct experiments, analyze data, and interpret results to solve engineering problems.

PO-5 Modern Tool Usage: Graduates should be proficient in using modern engineering tools, software, and equipment.

**PO-6 The Engineer and Society:** They should understand the impact of engineering solutions on society, including ethical, environmental, and safety considerations.

PO-7 Environment and Sustainability: Graduates should have knowledge of sustainable Arosal practices and their role in environmental preservation.

**PO-8 Ethics:** They should adhere to professional ethics and responsibilities.

PO-9 Individual and Team Work: Graduates should function effectively as individuals and as part of multidisciplinary teams. SVKM's

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**PO-10 Communication Skills:** They should be able to communicate effectively in both written and oral forms.

**PO-11 Project Management and Finance:** Graduates should understand project management principles and financial aspects related to engineering projects.

**PO-12 Life-Long Learning:** They should recognize the importance of continuous learning and professional development throughout their careers.

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## **Information Technology Department**

### Vision

Department of IT will impart quality education and conduct research relevant to needs of the national and international community which will help to improve quality of human life.

### **Mission**

To prepare human resource with technical and management skills to meet the contemporary Information Technology demands of the industry and society at large by delivering relevant curriculum, using the state of the art pedagogical innovations, and undertake relevant research.

### **Program Educational Objectives (PEO)**

- A. Technical Growth Graduates will be successful in modem engineering practice and entrepreneurship, integrate into the local and global workforce, and contribute to the economy of India.
- B. Professional Skills Graduates will continue to acquire and demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
- C. Professional Attitude and Citizenship-Graduates will become productive citizens demonstrating high ethical and professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.

### **Student Outcomes (SOs)**

Graduates of the 8 Tech. in Information Technology program will have an ability to:

- 1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- 2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- 3. Communicate effectively in a variety of professional contexts.
- 4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
- 5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

In addition to outcomes 1 through 5, graduates of the Information Technology program will also have an ability to:

Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.
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In addition to outcomes 1 through 5, graduates of the Cybersecurity program will also have an ability to:

6. Apply security principles and practices to maintain operations in the presence of risks and threats.

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## Metric No. 1.1.1 \*

## **Computer Engineering Department**

#### <u>Vision</u>

Play a significant role in creating Computer Engineering Graduates with sound technical and managerial skills of value to industry and society both at national and international level.

### **Mission**

The Computer Engineering Department endeavors for excellence in creating, applying and imparting knowledge in computer engineering through comprehensive curriculum and innovative teaching-learning process.

Provide a sound technical and managerial foundation and multifaceted development that prepares student to excel in higher education, research or technical/managerial profession that can adapt to rapidly changing technology in computer engineering.

### Program Educational Objectives (PEO)

- A. Technical Growth Graduates will be successful in modern engineering practice and entrepreneurship, integrate into the local and global workforce, and contribute to the economy of India.
- B. Professional Skills-Graduates will continue to acquire and demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
- C. Professional Attitude and Citizenship-Graduates will become productive citizens demonstrating high ethical and professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.

#### **Student Outcomes (SOs)**

Graduates of the B Tech. in Computer Engineering program will have an ability to:

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- 3. Communicate effectively with a range of audiences.
- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and Ringet STRAR objectives.

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- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.



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## Metric No. 1.1.1 \*

## **Artificial Intelligence Department**

#### <u>Vision</u>

Play a significant role in nurturing young engineering graduates with sound technical and ethical skills to cater to the needs of fast growing multidisciplinary application areas of artificial intelligence to address industrial and societal needs both at national and international level.

#### <u>Mission</u>

- 1. To focus on efforts to create comprehensive curriculum to ensure multifaceted development of students to address challenges in application areas of Artificial Intelligence such as healthcare, education, agriculture, smart cities, infrastructure, including mobility and transportation.
- 2. To build a strong teaching and research environment fostering strong analytical and problem-solving skills to prepare students to excel in higher education, research or technical/managerial profession.
- 3. To promote project based learning by providing opportunity to work on real life challenging problems through collaborative projects with industry and academia.

### **Program Educational Objectives (PEO)**

- A. Technical Growth Graduates will be successful in modem engineering practice and entrepreneurship, integrate into the local and global workforce, and contribute to the economy of India.
- B. Professional Skills-Graduates will continue to acquire and demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
- C. Professional Attitude and Citizenship-Graduates will become productive citizens demonstrating high ethical and professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.

### **Student Outcomes (SOs)**

Graduates of the B Tech in Artificial Intelligence program will have an ability to:

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

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3. Communicate effectively with a range of audiences.



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- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- 5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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### **Data Science Department**

### **Vision**

Play a distinct role in providing excellence in Data Science, A1tificial Intelligence, Machine Learning and Management fundamentals and concepts using scientific methods, processes, algorithms and systems to extract knowledge and insights, thereby creating human resources of value to industry and society both at national and international level.

### <u>Mission</u>

- 1. To prepare human resource in the areas of technical and management domains with strong analytical aptitude and problem-solving skills to meet the contemporary Business Analytics demands of the industry and society by delivering relevant curriculum, using the state-of-the-art pedagogical innovations developed by strong industry linkages, and undertake relevant research and consultancy.
- 2. Ensure multifaceted development of students, faculty and staff in computational sciences to Work on real life challenging problems through continuous introspection and inputs.
- 3. Set up the international linkages with Institutes/Industry of repute.

### Program Educational Objectives (PEOs)

The Program Educational Objectives of B. Tech Data Science, 8. Tech Integrated (Data Science), MBA Tech Data Science, M. Tech Data Science (Business Analytics) and M. Tech Artificial Intelligence Programs are to produce graduates and post graduates with the following objectives:

- A. Establish themselves as Data Scientists, Data Engineers, Artificial Intelligence and Machine Learning Engineers and Subject Matter Experts in various private and public sectors that are involved in the design, creation, maintenance and use of industrial and organization data and help nation building
- B. Solve real world problems by applying knowledge ethically that will benefit organizations and society at large.
- C. Adapt to changing trends in Data Science, Business Analytics, Artificial Intelligence and Machine Learning and become lifelong learners.

### **Student Outcomes (SOs)**

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural social, environmental, and economic factors.

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- 3. Communicate effectively with a range of audiences.
- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- 5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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### **Electronics and Telecommunication Department**

#### <u>Vision</u>

To build a strong teaching and research environment that caters to the needs of fast growing telecommunication domain.

#### **Mission**

- 1. Provide internationally recognized leaders in Electronics and Telecommunication, through a continuously improving educational program incorporating applied engineering aspects.
- 2. Create the knowledge of fundamental principles and innovative technologies through research in the area of Electronics and Telecommunication and hence teach the students the necessary research skills which satisfy the needs of growing economy.

#### **Program Educational Objectives (PEOs)**

- A. Technical Growth Graduates will be successful in modem engineering practice and entrepreneurship, integrate into the local and global workforce, and contribute to the economy of India.
- B. Professional Skills Graduates will continue to acquire and demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
- C. Professional Attitude and Citizenship Graduates will become productive citizens demonstrating high ethical and professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.

#### **Student Outcomes (SOs)**

Graduates of the B. Tech. in Electronics and Telecommunication Engineering program will have an ability to:

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- 3. Communicate effectively with a range of audiences.
- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

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- 5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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### **Civil Engineering Department**

#### Vision

Create competent Civil Engineering professionals and employable individuals with sound technical and management credentials to take part in state-of-the-art infrastructural development with global ensign for the benefit of the society.

#### **Mission**

- 1. Provide quality education in conformity with advancements in technology and management
- 2. Encourage relevant research, development and entrepreneurship qualities in students, faculty and staff through teamwork with learning.
- 3. Develop strong industry linkages to ascertain and resolve the socio-economic problems related to Civil Engineering, with due consideration to safety and economy in ethical manner.

#### **Program Educational Objectives (PEOs)**

- A. Technical Growth Graduates will be successful in modem engineering practice and entrepreneurship, integrate into the local and global workforce, and contribute to the economy of India.
- B. Professional Skills Graduates will continue to acquire and demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
- C. Professional Attitude and Citizenship Graduates will become productive citizens demonstrating high ethical and professional standards, make sound engineering or managerial decisions and have enthusiasm for the profession and professional growth.

### Student Outcomes (SOs)

Graduates of the B Tech. in Civil Engineering program will have the ability to:

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- 3. Communicate effectively with a range of audiences.
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

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- 5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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## Metric No. 1.1.1 \*

### **Mechanical Engineering Department**

#### **Vision**

To be center of excellence in Mechanical Engineering for education and research through creation of competent mechanical engineering graduates who can be employable in the industries and be a part of innovation, research, problem solving and entrepreneurship that prioritizes mankind in particular and society in general.

### <u>Mission</u>

- 1. To impart quality education in the field of Mechanical Engineering to the students.
- 2. To provide state of the art facilities to the students to enable them to learn, understand and apply fundamentals of Mechanical Engineering in solving engineering problems.
- 3. Developing relevant curriculum of studies which will cater to the needs of industry and society.
- 4. Promotion of team culture amongst students, faculties and staff to create conducive environment for better interaction with industries and collaborative research and development activities.

### **Program Educational Objectives (PEOs)**

- A. Technical Growth Graduates will be successful in modem engineering practice and entrepreneurship, integrate into the local and global workforce, and contribute to the economy of India.
- B. Professional Skills Graduates will continue to acquire and demonstrate the professional skills necessary to be competent employees, assume leadership roles, and enjoy career success and satisfaction.
- C. Professional Attitude and Citizenship Graduates will become productive citizens demonstrating high ethical and professional standards, make sound engineering or managerial decisions, and have enthusiasm for the profession and professional growth.

### **Student Outcomes (SOs)**

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- 3. Communicate effectively with a range of audiences.
- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, STRAR economic, environmental, and societal contexts.

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- 5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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## Mechatronics Engineering Department

### <u>Vision</u>

To be one of the leading Mechatronics engineering program by providing high quality education to our students through extensive industrial research enabling them to use modem automation technologies to develop innovative solutions.

### **Mission**

To offer multidisciplinary program that is the synergistic integration of electrical and electronics engineering, mechanical engineering, computational software, and hardware in the design of products and processes into the emerging field of mechatronics.

### Program Educational Objectives (PEOs)

The B. Tech (Mechatronics Engineering) graduates will:

- A. Apply mechanical engineering and electrical and electronics engineering skills to solve problems in mechatronics engineering.
- B. Integrate and use systems or devices incorporating modern microelectronics, information technology and modem engineering tools for product design, development and manufacturing.
- C. Demonstrate professional skills to communicate effectively with team members and work effectively to achieve design and project objectives.
- D. Engage in lifelong learning in their profession and practice professional and ethical responsibility.

### **Student Outcomes (SOs)**

Graduates of the B Tech. in Mechatronics Engineering program will have an ability to:

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- 3. Communicate effectively with a range of audiences.
- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet REGISTRAR objectives.

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- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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## **Technology Management Department**

#### Vision

"Nurturing Young Minds to help them transform into Leaders who can leverage appropriate Technology for Business goals."

### **Mission**

To develop the student as a multi-skilled person who will be able to solve real world problems holistically through:

- 1. A balance of appropriate Technology and Management inputs,
- 2. Substantial exposure to Industry and corporate work culture via twin Industry Internships in Technical and Management domains.
- 3. Imparting value based business practices by a mix of Academic and Industry experienced faculty.
- 4. Innovative and entrepreneurial mindset

### **Program Objectives of MBA Tech**

The Program aims to create Business Leaders who can leverage appropriate technology for Business excellence in the company they serve or for their entrepreneurial venture, displaying ethical and socially responsible behavior.

### PROGRAM LEARNING GOALS

The students should have

P Learning Goal 1: An understanding of global practices impacting organizations.

PLO I a- Demonstrate ability to understand management issues from a global perspective

PLO I b- Demonstrate ability to analyze cultural issues in a business organization

P Learning Goal 2: Critical thinking skills

PLO 2a -Analyze a business situation from multiple perspectives PLO 2b- Apply models/frameworks to reflect critically on specific business contexts

P Learning Goal 3 - Understanding Business Domains and Integration with Technology

PLO 3a- Describe the concepts related to functional areas of decision making in an organization SVKM's NMIN

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PLO 3b - Analyze and connect functional areas of Business



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PLO 3c- Integrate functional areas of business to support an overall organizational strategy

P Learning Goal 4- Effective communication skills

PLO 4a-Demonstrate effective communication skills PLO4b- Organize written thoughts into a coherent narrative

P Learning Goal 5: An understanding of ethical business models

PLO Sa- Demonstrate understanding of the relevance of ethics, and its role in governance, in public, private and not-for- profit sectors. PLO Sb- Identify the ethical concerns and consequences of a given business problem

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Program: B Tech All Program (except Data     Semester: III / IV / V / VII							
Science, Ci	vil and Mech	anical, CSE(D	S) 311 (VT	Г)]			
MBA Tech	All Program	(except Data	Science),	,			
B Tech Integ	grated Comput	er					
Course: Di	screte Mather	natics			<b>Course Code:</b> 7	02BS0C04	47
	Teaching S	Scheme			Evaluati	on Scher	ne
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marka 50)		erm End nations (TEE) arks - 100)	
2	0	1	3	Mar	ks Scaled to 50	Mark	s Scaled to 50
Pre-requis	ite: Linear Al	gebra and Or	dinary D	oifferer	ntial Equations		
understanding of mathematical proofs and common mathematical arguments. It will instil sound knowledge of different topics of discrete mathematics which students will readily apply in the subsequent courses of their programme.							
Course Ou	tcomes		U				
After com	pletion of the	course, stude	ents will k	oe able	to -		
1. Defi	ne and relate	basic notions	s of discre	ete ma	thematics		
2. Den	nonstrate the a	ability to und	lerstand 1	mather	natical logic, con	cepts in a	abstract algebra
and	mathematical	l proof techni	iques				
3. Solv	e problems ba	ased on comb	oinatorics	s, grap	h theory and abs	tract alge	bra
4.Demo	nstrate unde	rstanding of	the app	licatio	ns of algebra, co	ombinato	rics and graph
theory							
Detailed S	yllabus						
Unit I	Description						Duration
1. Se	t Theory, Rel	ations and F	unctions	. 4 . 17 .			
	costs I arus o	reyuisite com f set theory'	cepts - S	els, ve	nn uiugrams, Op	erulions	
Pe	wer set The	principle of I	nclusion	Fychus	ion Partitions of	sets	
Re	lations. Pror	erties and f	types of	binar	v relations. Equ	ivalence	06
re	lation.	mes und		~	,u		
Fu	nctions, injec	tive, surjectiv	ve and bi	jective	functions, Com	position,	
in	verse of a fun	ction.	- ~-	, -	-,	L - 7	4
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(Prepared by Corned Faculty/HOD)

2.	<b>Logic</b> <i>Revision of prerequisite concepts – 'Propositions, Truth table, Laws</i> <i>of logic, Equivalence'.</i> Satisfiability, tautology, validity, disjunctive and conjunctive normal forms, Predicates and Quantifiers, Proof Techniques, Mathematical Induction.	06
3.	<b>Combinatorics</b> Pigeonhole principle, Homogeneous and non-homogeneous linear recurrence relations with constant coefficients, Generating functions.	04
4.	<b>Graphs and Trees</b> Graphs and their properties, Degree, Connectivity, Path, Cycle, Eulerian graph, Hamiltonian graph, Planar graphs, Graph Coloring. Trees, Rooted trees, Spanning tree and minimum spanning tree, Kruskal's and Prim's algorithms for minimal spanning trees.	08
5.	<b>Abstract algebra</b> Definition and examples of groups, subgroups, cyclic groups, group homomorphism, group isomorphisms. Definitions and Examples of Rings and Fields.	06
	Total	30

#### **Text Books**

- 1. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, 8th Edition, Tata McGraw Hill, 2018.
- 2. Kolman, Busby and Ross, *Discrete Mathematical Structures*, 6th Edition, Prentice Hall India, 2015.

#### **Reference Books**

- 1. C. L. Liu, *Elements of Discrete Mathematics*, 4th Edition, McGraw Hill, New Delhi, 2017.
- 2. Seymour Lipschutz and Mark Lipson, *Discrete Mathematics*, 3rd Edition, McGraw Hill education, Schaum's Outline Series, 2017.
- 3. I. N. Herstein, "Topics in Algebra", , 2nd Edition, John Wiley and Sons, 1975.
- 4. Narsingh Deo, *Graph theory with Applications to Engineering and computer science*, 1st Edition, Prentice Hall India, 2016.

### Laboratory/ Tutorial Work

8 to 10 tutorials based on the syllabus.

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Program: B	Tech All Prog	gram [except	CSBS and	CSE(DS) 311	Semester:	III / VII	
(VT)], MBA	Fech All Prog	gram,					
B Tech Integ	rated Mecha	inical, Comp	uter				
Course: Tech	nnical Comm	unication			<b>Code:</b> 702	BS0C062	
	Teaching	Scheme			Evaluation	n Scheme	
Lecture	Practical	Tutorial		Internal Con	tinuous	Term End I	Examinations
(Hours	(Hours	(Hours	Credit	Assessmen	t (ICA)	T)	TEE)
per week)	per week)	per week)		(Marks -	- 50)		
0	0	1	1	Marks scale	ed to 50		-
Pre-requisite	e: Fundamen	tals of Englis	h Commu	nication			
Course Obje	ective						
The objective	e of the cours	se is to develo	op students	5' proficiency in v	vritten techr	ical commun	ication so
that they are	able to prod	uce documer	nts of the k	ind required in th	ne workplac	e, such as rep	orts and
letters, that a	letters, that are sound, effective, coherent and error-free						
Course Outo	omes						
After comple	etion of the c	ourse, the stu	ident will b	be able to –			
1. Appl	y the fundan	nentals of wri	tten comm	unication to crea	te written do	ocuments that	t are coherent,
error	-free and we	ll organized					
2. Deve	lop the abilit	y to create eff	ective and	persuasive busin	less correspo	ondence, such	as letters and
emai	ls, that follow	v etiquette an	id are able	to achieve the de	sired outcor	nes	
3. Creat	e basic repo	rts such as m	emo, letter	and survey-base	ed report, us	ing their und	lerstanding of
repor	t writing						
Detailed Syl	labus						
Unit De	scription	Contine TATAL					Duration
1. Prii Sali	opt fosturos (	ective writin	ng	Paragraph writ	ing 7 Cs of		
Com	munication	Making outl	ines Writi	ng for the Web	ing, 7 Cs of		02
		waking out	ines, with	ing for the web			
2. Wri	ting Skills						04
Not	e taking, Sur	nmarizing Fi	ction / No	n-fiction			
3. <b>Bus</b>	iness Corres	pondence					
Bus	iness letter w	riting – prino	ciples and t	types, Business e	mail writing	– subject	04
line	, recipient de	esign, languag	ge, structui	ring content, fran	ning, etiquet	te, cultural	
sens	sitivity						
LI							l
						A	elon -

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4.	Report WritingIntroduction – what is a report, types, and characteristics of reports, pre-writing, principles and of report writing, Ethics in Writing - plagiarism.Survey-based reportsMemo ReportLetter ReportAcademic Report (with References and Citations)	05
	Total	15
Text E	Books	

1. Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice*, 3<sup>rd</sup> ed. Oxford University Press, 2015

#### **Reference Books**

- 1. Shirley Mathew, Communication Skills, Technical Publications, 2013
- 2. Sheryl Lindsell-Roberts, Technical Writing for Dummies, Hungry Minds Inc., 2001
- 3. Mike Markel, Technical Communication, Palgrave Macmillan, 2012

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Program	n: B Tech (EXTC/ Computer/ Info CSE -Cyber Se MBA Tech (Inf Compu B Tech Integra	Mechatronic ormation Tech curity) formation Tech iter) ted (Compute	s/ nology / nnology / er)	Semester: III / VI Common Course	I		
Course	: Digital Logi	c Design		<b>Code :</b> 702EX0C0	14		
	Teaching	Scheme		Evalı	ation Schem	ie	
Lectury (Hours per week)	e Practical s (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks-50)	Term Examinatio (Marks	End ons (TEE) s -100)	
2	2	0	3	Marks Scaled to 50	Marks Sca	aled to 50	
Pre-requ	uisite: Basic Electr	conics					
Course This co construc circuits hardwa	<b>Objective</b> ourse introduces ction of digital s using basic bui re design.	the fundar ystems. It fu lding blocks	nental co rther pro and nec	oncepts and tech vides insight into essary techniques	niques unde designing d required in	rlying the ligital logic computer	
After co 1. E 2. D 3. D	<b>Outcomes</b> mpletion of the co explain the concep Develop combinati Design sequential o	ourse, student of digital sy ional circuits f circuits for va	ts will be a stem and for variou rious app	able to - logic simplificatior s applications lication	1		
4. Iı	mplement basic di	igital logic cir	cuits usin	g EDA tools with t	he help of HI	DL	
Detailed	d Syllabus					Duration	-
Unit	Introduction to	Digital Syste	me			Duration	-
1.	Number System one system to complement me weighted codes another.	s - Binary, Oc another, B ethod. Weigl - Grey and	tal, Hexac inary su nted code Excess 3,	lecimal, BCD, Conv btraction using 1 es - BCD and Bi conversion from	version from I's and 2's inary, Non- one code to	04	
2.	Logic Gates and Logic gates, Cor logic using uni Morgan's Theor maps up to 4 var	<b>Boolean Alg</b> ncept of unive iversal gates, rem, SOP & l riables.	<b>gebra</b> ersal logic , Review POS form	and implementation of Boolean algeb s, Canonical forms	on of digital ora and De s, Karnaugh	06	sol
3.	<b>Combinational</b> Combinational Multiplexers, DI logic using mult	<b>logic circuit a</b> circuits - E-multiplexer iplexers.	<b>ind its im</b> Adders, s, Decode	<b>plementation</b> Subtractors (half ers, Encoders, Desig	and full), gn of digital	RE SVK 07V L Vile	GISTRAR M's NMIMS Mehta Road, Parle (West).
					(S) (MUMB)	Mum 3	bai-400 056

	Sequential Logic Circuits	
	Flip flops - SR, T, D, JK, master slave JK, converting one flip-flop to	
	another,	
4	Registers - Serial input, serial output; serial input-parallel output;	
4.	Parallel In-Parallel Out, Serial In -Serial Out, Bi-Directional Shift	00
	Registers,	09
	Counters -Synchronous Counters, Asynchronous (Ripple) Counters	
	and asynchronous counter designing.	
	Introduction to VHDL	
_	VLSI Design flow - Design entry, Schematic, Different modelling	
5.	styles in VHDL - Dataflow, Behavioural and Structural Modelling,	04
	Data types and objects, Synthesis and Simulation of any basic digital	04
	logic circuits.	
	Total	30
Text Bo	oks	
1. N	Iorris Mano, Digital Design - With an Introduction to the Verilog HDL, VHD	L, and

## 2. R.P Jain, *Modern Digital Electronics*, 4<sup>th</sup> ed., Tata McGraw-Hill, 2013.

### **Reference Books**

1. Kumar A. Anand, Fundamental of digital circuits, 4th Edition, 2016.

System Verilog, 6th ed., Pearson Education, 2018.

- 2. D.P. Kothari and J.S. Dhillon, *Digital Circuits and Design*, Pearson Education, 2015.
- 3. Roth and John, *Principles of Digital Systems Design*, 6<sup>th</sup> Edition, Ceneage Learning, 2011.

#### Laboratory Work

8 to 10 practical exercises (and a practicum) based on the syllabus.

Signature (Head of the Department)



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Program:	B Tech (EXTC/ Mechatronics/ Information Technology / CSE -Cyber Security) and MBA Tech (Information Technology)			Semester: III Common Course		
Course: Signals and Systems				Code: 702EX0C010		
	Teaching S	Scheme		Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks- 100)	
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50	

Pre-requisite: Calculus

#### **Course Objective**

This course helps to develop and analyse continuous and discrete time signals and systems. It also forms the foundation for further studies in the areas such as speech/audio processing, image processing, and communication systems.

#### Course outcomes

After completion of the course, students will be able to -

- 1. Classify the continuous time and discrete time signals and systems
- 2. Apply various mathematical operations to analyze signals and systems
- 3. Analyze the continuous time signals and systems using various transforms
- 4. Determine the frequency spectrum of discrete time signals and systems response

#### Detailed Syllabus

Unit	Description	Duration
1.	<b>Introduction to Signals and Systems</b> Signals - definitions, classification, elementary continuous and discrete time signals, operations on continuous and discrete time signals, system and its classification.	05
2.	Linear Time Invariant System Continuous and discrete time LTI systems, convolution integral and convolution sum, interconnection of systems, series, parallel and mixed.	05 Aroda



3.	Fourier Series Representation of Periodic Signals	
	Introduction to different types of Fourier series representation,	04
	Exponential Fourier Series representation of continuous time	
	periodic signal, magnitude and phase spectrum.	
4.	Fourier Transform	
	Fourier transform of elementary signals and its frequency spectrum, properties of Fourier transform, inverse Fourier transform, analysis	06
	of LTI continuous time system in frequency domain.	
5.	Laplace Transform	
	Limitations of Fourier transform, introduction to Laplace	05
	transform, ROC and its properties, Laplace transform of elementary	
	signals, properties of Laplace transform, inverse Laplace transform,	
	solution of differential equation.	
6.	Z-transforms	
	Introduction to Z transform, Z transform of elementary signals,	05
	ROC, properties of Z transform, inverse Z transform, solution of	
	difference equation.	
	Total	30
Text Bo	poks	
1.	Tarun Kumar Rawat, <i>Signals and Systems</i> , 1 <sup>st</sup> Edition, Oxford Univer 2010.	rsity Press,
2.	Nagoor Kani, Signals and Systems, 1st Edition, McGraw-Hill publication	n, 2010.
Referen	nce Books	
1. <u>(</u>	( <u>Classic</u> ) Oppenheim & Willsky, <i>Signal and Systems</i> , 2 <sup>nd</sup> Edition, Prentice	e Hall of
2	Simon Havkin & Barry Van Voon Signal and Systems 2nd Edition John V	Vilov
<b></b>	publication. 2008	viiey
Labora	tory Work	
	10 practical overgines (and a practicum) based on the cullebus	
0.00	TO PLACHCAL EXELCISES (AND A PLACHCULLI) DASED ON THE SYNADUS.	

Signature (Head of the Department)



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<b>Program:</b> B <sup>7</sup> Engineering	Tech (Artificial , Information T	Intelligence, I echnology, C	Data Science SE (Cyber)	ce, Computer , AI and ML,	Semes	ter : III/IV	
MBA Tech A	All Programs	, computer 50	cicicc)				
Course: Dat	abase Manager	nent Systems			Code: 2	702AI0C002	1
	Teaching S	Scheme		E	valuatio	on Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous lit Assessment (ICA)		Terr Examina (Marl	m End tions (TEE) ks - 100)
2	2	0	3	(Narks Scaled	<b>50)</b> 1 to 50	Marks S	, Scaled to 50
Pro requicite: Nil							
Course Ob:							
The objective concepts for maintain an system.	The objective of the course is to provide a comprehensive introduction to the fundamental concepts for design and development of database systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a database management system						
Course Out	comes						
After compl	etion of the cou	ırse, student v	vill be able	to -			
1. Descr	ibe core conce	ots of database	e and mode	el a database m	anagem	ent system	through
ER m	odelling	frolational alc	when and a	tructured anon	u longu	a to rotri	ave and
2. Appi	ge data from re	lational data	yebra anu s base	structured quer	y langua	age to retrie	eve and
3. Demo	onstrate the use	e of normaliza	tion for da	tabase design			
4. Demo	onstrate the cor	ncept of transa	octions and	use modern da	atabase (	techniques	such as
NoSQ	2L						
Detailed Sy	llabus						
Unit 1	Description						Duration
1 Ir D D A	1       Introduction       03         Database System Applications, Purpose of Database Systems, View of       03         Data, Database Languages, Data Models, Database Users and       04         Administrator       03					03	
2 D O C So E	<b>atabase Desig</b> verview of t onstraints, En chemas, Schem R features	<b>n and the E-R</b> he Design I tity Relations a Diagrams , F	<b>Model</b> Process, T ship Diag Entity-Rela	The Entity-Rela rams, Reduction tionship Desigr	ationshi on to 1 Issues,	p Model, Relational Extended	05
3 Ir	ntroduction to	the Relational	l Model				03
L							A





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NA

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	Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Basic operators of Relational Algebra,	
4	<b>Structured Query Language</b> Overview of the SQL Query Language, SQL Data Definition, SQL Constraints, Basic Structure of SQL Queries, Additional Basic Operations, DML operations, Set operations, Aggregate Functions, Nested Sub- queries, Joins, views	06
5	<b>Relational Database Design</b> Features of Good Relational Designs, Problems with bad design, Decomposition using concept of functional dependencies, Armstrong's axioms, Closure of functional dependency, Closure of attribute, Introduction to process of Normalization and de-normalization, Normal Forms- 1NF, 2NF, 3NF, BCNF	05
6	<b>Transactions</b> What is Transactions? Properties of transaction, Transaction states, Issues with concurrent executions, Schedules, Serializability- Conflict and View	04
7	<b>Introduction to NoSQL</b> Overview of NoSQL, characteristics of NoSQL, Storage types of NoSQL, Implementing NoSQL in MongoDB - Managing Databases and Collections from the MongoDB shell, Finding Documents in MongoDB collection from the MongoDB shell.	04
	Total	30
Text Boo	ks	
1. He	ennery Korth and Abraham Silberschatz, Database System Concents, 7th Editic	on. McGraw

- Hill, 2019
- 2. Gaurav Vaish, Getting Started with NoSQL, 1st edition, Packt Publication, March 2013
- 3. Brad Daylel, *NoSQL with MongoDB in 24 Hours*, 1<sup>st</sup> edition, Sams Teach Yourself, January 2015

#### **Reference Books**

- 1. Elmarsi and Navathe, Fundamentals of Database Design, 7th Edition, Addison Wesley, 2019
- 2. Bob Bryla, Kevin Loney *Oracle Database 12C The Complete Reference*, 1<sup>st</sup> edition, Tata McGraw Hill, 2017

### Laboratory Work

8 to 10 experiments (and a practicum where applicable) based on the syllabus



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Signature (Prepared by Concerned Faculty/HOD)

<b>Program:</b> B Tech (Artificial Intelligence, Computer					Semester: III/V/V	I/VII
Engineering, Information Technology, Electronics &					, ,	
Telecom	munication	Engineerin	Cyber), AI and ML,			
AI and D	S, CSBS, Co	omputer Sc				
MBA Tee	ch (Artificia	l Intelligen	uter Engineering,			
Informat	ion Techno	logy)				
BTI Com	puter Engir	neering				
Course:	Computer N	Networks			Code: 702AI0C007	
	Teaching	Scheme		Evalu	ation Scheme	
Lecture	Practical	Tutorial		Internal Continuous	Term End Exa	minations
(Hours	(Hours	(Hours	Credit	Assessment (ICA)	(TEE)	
per	per	per	cicult	(Marks - 50)	(\\[1]-	100)
week)	week)	week)		(1.1.1.0 00)	(IVIARKS -	100)
2	2	0	3	Marks Scaled to 50	Marks Scale	ed to 50
rerequi	site: NA					
<b>Course</b> (	Jbjective	daa itaa (				a thur1
I IIIS CO	urse provi	ues the f	undamer	ital knowledge of c	omputer network	s through
anaersta	naing each	l layer of c	formation	network architecture,	and transmission	systems to
network	application	ns. It also	rocuses	on congestion contro	a techniques, prot	ocois, and
Conree	Dutcomes	к.нон5. 				
After cor	npletion of	the course	students	will be able to -		
$1 E_{1}$	mplein the co	oncepts of a	romputer	networks, topologies a	ind data communic	ation.
2 A	nalvze the v	various erro	or detection	on and correction and r	nedium access tech	niques
2. A	nnlv netwa	ork laver	addressi	ng and routing tech	niques to differen	t network
J. A	nologies	ork rayer	uuurcoon		inques to unicien	
	pologies. nalvzo tho c	lifforent pr	otocole of	the lavered architectur	re of computer not	vorke
H. A		incrent pr	0100015 01		ie of computer netw	VUINJ.
Unit	Descriptio	n				Duration
1	<u>Introductio</u>	n				02
_	Computer	Network.	Peer-to-r	peer and client-server	communication.	
	Classificatio	ons of com	outer netv	vorks, Network Topolo	gies.	
2	Physical La	yer		·	0	02
	Introduction	n to OSI an	d TCP/IF	<sup>o</sup> model, Transmission	Media.	
3	Data Link I	Layer and N	Medium A	Access Sub Layer		07
	Fundament	als of Erro	r Detecti	on and Error Correcti	on, Block coding,	
	Hamming	Distance, l	Flow Cor	ntrol and Error contro	ol; error control	
	mechanism	- CRC; flov	v control	protocols - Stop and Wa	ait ARQ, Go-back-	
	N ARQ, Se	elective Re	peat ARQ	Q, Multiple access pro	otocols - Random	
	Access - Pu	re ALOHA	, Slotted A	ALOHA, CSMA/CD, C	CDMA/CA.	
				(atal)		And



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	4	Network Layer						
		Switching techniques, IPV4 addressing, subnet mask, classless inter-						
		domain routing (CIDR), IPV6; Address mapping – ARP, RARP, and						
	DHCP, shortest path algorithm- RIP, Bellman-ford algorithm, link state							
	routing, Dijkstra's algorithm, Open shortest path first protocol (OSPF).							
	5	5 Transport Layer						
		Process to Process Communication, User Datagram Protocol (UDP)-						
		services, operation; Transmission Control Protocol (TCP) - features, 3-						
		way handshaking, comparison of UDP and TCP, SCTP, Congestion						
	Control - open loop and close-loop; Quality of Service (QoS), QoS							
		improving techniques - Leaky Bucket and Token Bucket algorithms.						
(	6	Application Layer	04					
	HTTP, DNS, FTP, SMTP.							
		Total	30					
Te	xt Bo	ooks						
1.	А.	S. Tanenbaum, Computer Networks, 5th edition, Pearson Prentice Hall, 2018						
2.	Bel	hrouz A. Forouzan, Data Communications and Networking, 5th edition, Me	Graw-Hill					
	Hig	gher Education, 2017						
Re	ferer	nce Books						
1.	W. 5	. Stallings, Data and Computer Communications, 8th edition, Pearson Prentice Hall, 2017						
2.	Beh	hrouz A. Forouzan and Sophia Chung Fegan, TCP/IP Protocol Suite, 4th edition,						
	McC	cGraw-Hill Higher Education, 2019 (Re-print)						
3.	Albe	berto Leon-Garcia and Indra Widjaja, Communication Networks: Fundamental Concepts and						
	Keu	<i>ry Architectures</i> , 2 <sup>nd</sup> edition, McGraw-Hill, 2004 (Classic)						

 James F. Kurose and Keith W. Ross, Computer Networking - A Top-down Approach, 8<sup>th</sup> edition, Pearson, 2018 (Re-print)

#### Laboratory Work

8 to 10 experiments (and a practicum where applicable) based on the syllabus.

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Program: B Tech (Artificial Intelligence, Computer						er: III/IV/V	
Engineering, Information Technology, CSE (Cyber), AI							
and ML, AI and DS, CSE (DS), Computer Science)							
MBA Tech (Artificial Intelligence, Computer Engineering,							
Information Technology)							
Course: Web Programming					Code: 702AI0E005		
Teaching Scheme					Evaluation Scheme		
Lecture (Hours	Practical (Hours	Tutorial (Hours	Credit	Internal Continuous Assessment (ICA)		Term End Examinations (TEE)	
per	per	i Dei i			- ( - )		
per week)	per week)	week)		(Marks	- 50)	(Marks - 100)	
per week) 2	per week) 2	week)	3	<b>(Marks</b> Marks Scal	<b>- 50)</b> led to 50	<b>(Marks - 100)</b> Marks Scaled to 50	

Prerequisite: Computer Programming

#### **Course Objective**

The objective of this course is to develop modern web application by leveraging latest technologies. It helps them to learn new technologies by applying foundation paradigms, building strong expertise to develop end to end application - web frontend and backend development.

#### **Course Outcomes**

After completion of the course, students will be able to -

- 1. Explain the fundamentals of web programming
- 2. Design front end of a web application
- 3. Establish database connectivity between front-end and back-end

#### Detailed Syllabus

Unit	Description	Duration
1.	Introduction Concept of website, its need and purpose, Types of websites: Static and dynamic website, Introduction to HTML, XML, JSON, Web Browsers, – Web Servers, Uniform Resource Locator, Tools and Web Programming Languages, HTTP, Web Standards, Tiered Architecture: Client Server Model, Three Tier Model	02
2.	Hyper Text MarkUp Language Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms	05



Signature (Head of the Department)





3.	Cascading Style Sheets (CSS3)	05					
	Basics of Cascading Style sheets, Advantages of CSS, External Style						
	sheet. Internal style sheet. Inline style sheet. CSS Syntax, color.						
	background, Font, images						
4.	4. Java Script Features of JavaScript, extension of JavaScript, Syntax of JavaScript: data types, operators, variables, tag, Document Object Model (DOM) with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while, do while, break and continue, Form Validation using JavaScript.						
5.	<b>Angular JS</b> Introduction to Angular JS, Single Page Application, Angular features, Expressions, Modules, Directives, Model, controllers, Data bindings, Scopes, Tables, Angular JS Forms and validation, Services, HTTP, Dependency Injection, Events.	08					
6.	Node JS	06					
	Introduction, Modules, HTTP module, URL module, File system,						
	NPM, Events and Event Emitter, Exception handling.						
	Introduction, Express is, create database, create table, insert, update						
	select, delete, where, order by, drop table.						
	Total	30					
Text Books							
1. DT Editorial Services, HTML 5 Black Book, Dreamtech Press, 2 <sup>nd</sup> Edition, 2016							
2. Ken Williamson, <i>Learning AugularJS – A Guide to AngularJS-Development</i> , Oreilly Media,							
1 <sup>st</sup> Edition, 2015 2 Respect Ali Strod Resignation Node is 1 <sup>st</sup> adition America 2014							
5. Dasart An Syeu, beginnig noue .js, 1 <sup>st</sup> eution, Apress, 2014							
Reference Books							
1. Laurence Svekis, <i>Nioaern vveo Design with HTNL5</i> , CSS3, and JavaScript, 3rd Edition, Packt Publishing 2020							
2. Achyut	2. Achyut Godbole, Web Technologies, Tata McGraw-Hill, 3rd Edition, 2013.						
3. Azat M	3. Azat Mardan, "Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB, 2 <sup>nd</sup> Edition,						
Apress, 2015							
Laboratory/ Tutorial Work							
8 to 10 experiments (and a practicum where applicable) based on the syllabus							



Signature (Head of the Department)



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Program: B Tech/MBA Tech Information Technology       Semester : V								
Cours	e: Embedded Svst	tems			Code	:702IT0C015	;	
	Teaching	Scheme		Ev	aluatio	n Scheme		
Lectu (Hou per weel	re Practical (Hours k) per week)	Tutorial (Hours per week)	Credit	Internal Contir Assessment (I (Marks- 50	rnal Continuous sessment (ICA) (Marks- 50) (Mar		m End tions (TEE) ks- 100)	
2	2	0	3	Marks Scaled	to 50	Marks Sc	caled to 50	
Pre-re	quisite: Program	ming for Pro	oblem Solvi	ng, Operating Syst	tems			
Course The ob archite and us	e Objective ojective of this cou ecture using RTOS se it for designing	urse is to acc 5 and enable and develop	quire knowl e the studen ping embed	edge about the de its to understand e ded solutions.	velopme embedde	ent of embec ed-system p	lded system rogramming	
Cours	e Outcomes							
After c 1. 1 2. 1 6 3. 1	completion of the Explain embeddee Identify how mic embedded system Develop solutions	course, the s d system arc croprocessor design s for various	student will chitecture ar , memory, real time ap	be able to - nd RTOS peripheral compo pplications using E	onents a Embeddo	nd buses in ed programr	teract in an ning	
Detail	ed Syllabus						<b>D</b>	
Unit	Description						Duration	
1.	Introduction to Embedded Systems04Classification of Embedded System, Concept of Embedded System Design, and Design challenges: Processor technology, IC technology, Design technology and Trade-offs.04							
2.	Architecture of Embedded System Hardware Architecture, Software Architecture, Embedded System product Development Life cycle.						04	
3.	Real-Time Operating Systems (RTOS)         RTOS Architecture, Selecting Architecture, Architecture of the kernel, Tasks and Task Scheduler, Scheduling algorithms, Interrupt Service Routines, Semaphores, Mutex, Mailboxes, Message queues, Event Registers, Pipes, Signals, Timers, Memory management, Priority Inversion problem.						06	
4.	<b>Processor and memory Organization</b> Classification and brief overview of microcontrollers, microprocessors and DSP's. Introduction and Architecture of PAL, PLA, CPLD, FPGA, ASIC, PSOC.					06		
5.	Overview of Ha	rdware -So	ftware co de	esign			04	
	Fundamental Iss Embedded syst (UML), Hardwar	ues in Hard em design, re Software	ware-Softwa Introductio Trade-offs.	are co-design, Com on to Unified M	nputatio lodeling	n models in 5 Language	Arosal	
6.	Embedded softv	vare develo	pment envi	ronments			06	
	Challenges and System calls and	issues in en d Programn	nbedded so ning langua	ftware developme ages: assembly lar	ent, Dev 1guages,	rice drivers, , high level	REGISTI SVKM's N	RA MI
Pat Sor SVK Mur	el sego IMS 100 IMS 100 IMS 100 IMS 100					AN WUMBAUSS OF	Vile Parle ( Mumbai-400	Roa Wes

languages like C/C++, Source Code Engineering tool for Embedded C/C++. Introduction to Embedded Java.						
Total	30					
Text Books						
<ol> <li>Raj Kamal, Embedded Systems Architecture, Programming, and Design, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2019.</li> <li>K.V. Shibu, Introduction to Embedded Systems, 2<sup>rd</sup> Edition, Tata McGraw, 2016.</li> </ol>						
Reference Books						
1. Valvano, <i>Embedded Microcomputer Systems: A real time interfacing</i> , 3 <sup>rd</sup> Edition, Cengage Learning, 2013.						
Laboratory Work						

8 to 10 programming exercises based on the syllabus.

Signature (Head of the Department)

And




<b>Program</b> Tech/M Artificia	: B Tech/ME BA Tech Con l Intelligence	BA Tech Infor nputer Engin , B. Tech CSE	mation Techn eering, B Tech - (Cybersecuri	ology, B I/MBA Tech ity), B Tech CSBS	Semester : III,	V, VI
Course :	Software En	gineering			Code: 702IT0	C016
Lecture (Hours per	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal ContinuousTeAssessment (ICA)Examin(Marks- 50)(Ma		rm End ations (TEE) rks- 100)
2 veekj	2	,	3	Marka Scalad to 5	0 Marka	Scaled to 50
∠ Proroau	isite: Program	nming for Pr	oblem Solving		0 Marks 3	beated to 50
The ob practic develo Course After co: 1. Ex	jective of the es and stand p the ability a <b>Dutcomes</b> mpletion of the plain the char oject	e course is to lards require and skills for he course, the racteristics o	familiarize th ed to develop <u>the task of rec</u> e student will l f various proce	ne students with Soft a quality software auirement analysis, d be able to - ess models used in th	ware engineeri The course al lesign and mode	ng principles, so intends to elling. of a Software
2. De fo: 3. A <sub>1</sub> 4. Ct Detailed	emonstrate and the software oply UML co- eate test case <b>I Syllabus</b>	n understand e developmen ncepts for mo s for validati	ing of various nt odeling softwa ng the workin	Analysis and Designer functionality for a g of the software dev	n models that p given scenario veloped	Duration
Unit						Durution
1. <b>I</b> F	<b>mportance o</b> Role of Softwa	<b>f Software</b> En are, Categorie	<b>ngineering</b> es of Software,	Legacy Software, So	oftware Myth.	03
2. <b>H</b> H I <i>A</i> I	Prescriptive F Process Frame Aodel, Increm Development Agile Process Agility, Agile Development,	Waterfall el, Concurrent ware	07			
3. I 3. S	J <b>ML Modeli</b> Jisual modeli dentifying cla ttributes, pro tate diagram equence and	classes, ng events and chaviour,	08 Arosard			
Pate/					NIS NAMA	REGISTRA SVKM's NMI V L Mehta Roa Vile Parle (Wes Mumbai-400 05



4.	Requirement Analysis & Design Requirement Engineering tasks, Elements of Analysis Model, Data Modeling Concepts, Data Flow Model, and Control Flow Model.	03
5.	Architectural Design Software Architecture, Data Design, Architectural Styles, Representing System in Context, Refining Architecture into Components, Mapping Data Flow into a Software Architecture.	03
6.	<b>User Interface Design</b> Golden Rules for User Interface Design, Interface Analysis & Design, Interface Design Steps.	02
7.	Testing Strategies & Software QualityTest Strategies for Software, Verification & Validation Testing, Unit Testing,Integration Testing, System Testing.McCall's Software Quality Factors, ISO 9126 Quality Factors, Process &Project Metrics, Metrics for Software Quality, SQA Activities, CMMI.	04
	Total	30
Text B	Books	
1.	Pressman and Roger S., <i>Software engineering: a practitioner's approach</i> , 9 <sup>th</sup> Edition Hill, 2019.	n, McGraw
Refere	ence Books	

1. Sommerville and Ian., *Software engineering*, 10<sup>th</sup> Edition, Pearson Education, 2017.

Laboratory Work

8 to 10 programming exercises (and a practicum) based on the syllabus.

Signature (Head of the Department)

And

REGISTRAR SVKM's NMIMS V L Mehta Road, Vile Parle (West), Mumbai-400 056.



Course: V	ourse: Visual Analytics Code: 702IT0C025							
	Teaching	Scheme			Evaluat	ion Scheme		
Lecture (Hours p week)	ecture Practical (Hours per veek) (Hours per week) (Week) (Marks - 50) (Marks - 50)		End ons (TEE) 5 - 100)					
0	2	0	1	Marks scal	ed to 50	-	,	
Pre-requi	site: Basic comp	outer knowledge	e, Data Wa	rehousing a	nd Mining	5		
<b>Course Objective</b> The objective of the course is to familiarize the students with tools and processes to analyze datasets using visual representations of the data. The course helps students to visualize the data in graphs, charts, maps etc., and thereby identify patterns and develop actionable insights that help one to make better, data-driven decisions								
Course O	utcomes							
After com	pletion of the co	ourse, student w	rould be a	ble to-				
<ol> <li>Demonstrate a working knowledge of data visualization</li> <li>Create visualization charts appropriate for the underlying data</li> <li>Apply modern statistical learning techniques on data visualizations</li> <li>Design and implement interactive links between various objects in a data visualization report</li> </ol>								
Detailed S	Syllabus							
Unit	Description						Duration	
							2 414000	
1.	Getting Starte What is data Exploring Vis the course env	ed with Visual a a visualization, sual Analytics Co vironment and s	<b>analytics</b> methodo oncepts, U cenario.	ology for d Jsing Visual	ata visua Analytics	al analytics, , Discussing	2	
1. 2.	Getting Starte What is data Exploring Vis the course env Data investig Accessing dat to find comr properties of items joining	ed with Visual a a visualization, sual Analytics Covironment and s ation and prepa a from local dev non issues. Da data items, app tables/column	analytics methode oncepts, U cenario. ration ice/ serve ta prepar olying dat	ology for d Jsing Visual er/social mec ration - clea a source filte ploration wit	ata visua Analytics lia. Data i ning, mo er, creatin h generat	al analytics, b, Discussing nvestigation odifying the ng new data red dataset	2	
1. 2.	Getting Starte What is data Exploring Vis the course env Data investig Accessing dat to find comm properties of items, joining Using Visual	ed with Visual a a visualization, bual Analytics Co vironment and s ation and prepa a from local dev non issues. Da data items, app tables/ columns analytics Explo	malytics methode oncepts, U cenario. rration ice/ serve ta prepar olying dat s, Data ex rer	ology for d Jsing Visual er/social mec ration - clea a source filt ploration wit	ata visua Analytics lia. Data i ning, mo er, creatin h generat	al analytics, b, Discussing nvestigation odifying the ng new data red dataset.	2 3 5	
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1. 2. 3. 4.	Getting Start What is data Exploring Vis the course env Data investig Accessing dat to find comm properties of items, joining Using Visual Examining th data items pr with advance Data visual and Modern statis	ed with Visual a a visualization, sual Analytics Co- vironment and s ation and prepa a from local dev mon issues. Da data items, app tables/ columns analytics Explo e visual analytic roperties, creati d analytics. nalytics tical learning tee	nalytics methode oncepts, U cenario. rration ice/ serve ta prepar olying dat s, Data exp rer cs explora ng visual	ology for d Jsing Visual er/social mec ration - clea a source filt ploration wit itions, selecti izations, Enl on data visua	ata visua Analytics lia. Data i ning, mo er, creatin h generat ng data a hancing v	al analytics, b, Discussing nvestigation odifying the ng new data red dataset. and defining visualization	2 3 5 4	
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# Total

30

# Text Books

- 1. Kieran Healy, *Data Visualization: A Practical Introduction*, 1st Edition, Princeton University Press, 2018.
- 2. Cole Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Business *Professionals*, 1st Edition, Wiley; 2015.

# **Reference books**

- 1. Visual Analytics 7.5: User's Guide by SAS Institute (online SAS documents).
- 2. Trevor Hastie Robert Tibshirani Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction,* 2<sup>nd</sup> Edition, Springer, 2017.

#### Laboratory Work

8 to 10 Programming exercises (and a practicum) based on the syllabus.

And





Progra	Program: B Tech IT/MBA Tech Information Technology Semester: V							
Course: Advanced Data StructuresCode: 702IT0E009								
	Teaching Scheme Evaluation Scl							
Lectur (Hour per week	re Practical rs (Hours per c) week)	al Tutorial s (Hours per week)	Credit	Internal Con Assessmen (Marks -	ttinuous t (ICA) · 50)	Tern Examinat (Mark	n End ions (TEE) s - 100)	
2	2	0	3	Marks Scale	ed to 50	ed to 50 Marks scaled to 5		
Prereq Course The ob real wo	<b>uisite:</b> Program e <b>Objective</b> jective of this co prld problems.	ming for Pro	oblem Solving miliarize stud	ents with adva	inced data	a structures us	sed to solve	
After c 1. Ch to 2. De 3. Us 4. Im Detaile	ompletion of th noose appropria design algorith esign and Imple se and Implement plement patter.	e course, stu ite data struc ms for a spe ment solutic nt red-black n matching a	dent would b ctures and alg cific problem. on for a given trees, B-trees algorithms for	e able to- orithms, under real time probl and Splay tree various text p	rstand the lem using s rocessing	ADT/librarion hashing tech applications	es, and use it niques	)
Unit	Description	1					Duration	
1	<b>Dictionaries</b> Definition, Die	ctionary Abs	tract Data Typ	pe, Implementa	ation of D	ictionaries.	3	
2	Hashing Review of Ha Hashing, Sepa Probing, Doub	8						
3	<b>Trees</b> Binary Search Trees	-Trees, Splay	5					
4	<b>Graphs</b> Introduction, s and Dijkstra's	rd Algorithm	4					
5	Text Processing       6         String Operations, Brute-Force Pattern Matching, The Boyer-Moore       6         Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed       6         Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common       6         Subsequence Problem (LCS), Applying Dynamic Programming to the LCS       6							
6	<b>Design Techn</b> Divide and co Bound, Backtr	<b>iques</b> nquer, Greec acking Tech	dy Algorithm; niques.	Dynamic Prog	gramming	, Branch and	4 REGISTI SVKM's N V L-Matri	RAR MIM
an pat	Total					NUMBRISS ON	Vile Parle ( Mumbai-400	Road, West), 0 056.

#### Text Books

- 1. Thomas H. Cormen, Charles E. Leiserson, and R.L. Rivest. *Introduction to Algorithms*, 4<sup>th</sup> Edition, MIT Press, 2022
- 2. Narasimha Karumanchi, *Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles*, 5<sup>th</sup> Edition, Careermonk Publications, 2016.

#### **Reference Books**

- 1. Seymour Lipschutz, *Data structures with C*, 1<sup>st</sup> Edition, Schaum's Outlines, 2017.
- 2. M T Goodrich, Roberto Tamassia, Algorithm Design and Applications, John Wiley, 2015.
- 3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman. *The Design and Analysis of Computer Algorithms*, Pearson Education (Singapore) 2008.

#### Laboratory Work

8 to 10 Programming exercises (and a practicum) based on the syllabus.

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Teachi:         Teachi:         Practical (Hours per week)         2         site: Databas         Dbjective         se gives an it         con Technol         e in the mar         Dutcomes         npletion of the         xplain the ro         nalyze existitienario         escribe the in         curity and e         Syllabus         Description         oundations of         /hy Information         anagerial co	ng Scheme Tutorial (Hours per week) 0 se Managem ntroduction ogy / Info ket. ne course, th le of Informating thical concerner of Informating thical concerner of Informating thick about	Credit 3 ent Systems to Manageme rmation System e student will ation System i applications in of social media the managem rns on systems ar ? Fundamenta it the compone	Evalu         Internal Continuou         Assessment (ICA)         (Marks-50)         Marks Scaled to 50         ent Information Systements help organization         be able to -         n business environments         n use and design a buse         a on organizations         nent of global information	ation Scheme       Is Term Examinati (Mark       0     Marks Sc       ns. It aims at expons to achieve       nt       siness application       ation systems an	n End ions (TEE) is- 100) aled to 50 plaining how competitive n for a given id assess the Duration
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trategic Use undamentals verview of bu rategy.	of Informat of strategi usiness strate	<b>ion Systems</b> ic advantage egy, organizat	-What is strategic ional strategy and info	advantage, brief rmation systems	6 <b>04</b>
orter's five fo	orces model.				
<b>sing Inform</b> lajor concep chnology (h her informa	ation Techn ots, develop ardware, so tion processi	ology for stra oments, and oftware, netwo ing technologi	tegic advantage management issues orks, data resource m ies such as the Interne	in information anagement, and t).	04
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B Tech/MBA Tech I.T./Sem V/AY 2023-24/Page 9

	Customer relationship Management (CRM) systems - What is CRM? Three phases of CRM, Benefits, challenges and trends in CRM Supply Chain Management (SCM) systems - What is SCM? Role of SCM, Benefits, challenges and trends in SCM.	
5.	<b>Business Applications-II</b> Decision support systems (DSS) – Introduction, DSS components, Decision and management, information quality, Reporting, Online analytical processing, Using DSS – what-if analysis, sensitivity analysis, Goal-seeking analysis, Optimization analysis, Data mining for decision support. Knowledge Management and Business Analytics - Data, information and Knowledge, What is knowledge Management, Managing Knowledge to Business Intelligence, Why manage knowledge, Knowledge management processes, Components of business analytics.	05
6.	<b>Social Media and Organizations</b> Leveraging social media for business, What to track in social media, Network effects for organizations, Social computing applications (Enterprise social computing) and implications on organizations.	04
7.	Management Challenges Security, Ethical and Societal Challenges Global Management of Information Systems – Cultural, political and geo- economic challenges, Global business/IT strategies and applications, Global data access issues.	04
	Total	30
Textbo	poks	
1.	Kenneth C.Laudon and Jane P. Laudon, <i>Management Information Systems – M</i> <i>Digital firm</i> , 14 <sup>th</sup> Edition, Pearson Education, 2016.	lanaging the
2.	James A O'Brien and George M Marakas, <i>Management Information Systems</i> , 11 Tata Mc-Graw-Hill, 2017.	L <sup>th</sup> Edition,
Refere	ence Books	
1.	Effy Oz, Management Information System, 6th Edition, Cengage Learning, 2013.	
Labora	atory Work	
8 to 10	programming exercises based on the syllabus.	

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Progra	Program: B Tech/MBA Tech Information Technology Semester : V							
Cours								
	Teaching Scheme Evaluation Scheme							
Lectu (Hou per weel	re rs r (Hours k) per week)	Tutorial (Hours per week)	Credit	Internal Contine Assessment (IC (Marks- 50)	nternal Continuous Assessment (ICA) (Marks- 50) (Mar		n End ions (TEE) cs- 100)	
2	2	0	3	Marks Scaled to	o 50	Marks S	caled to 50	
Pre-re	quisite: Web Tecl	hnology, Sof	tware engir	neering				
Course To ena	<b>e Objective</b> able the students i	mplement d	istributed w	veb enterprise archi	tecture	s using micr	o services.	
After of 1. D 2. E: 3. E: Detail	e Outcomes completion of the esign and implem xplore semantic w xecute web service ed Syllabus	course, the s ent web ser eb to create e integration	tudent will vices for cre ontologies a , deployme	be able to - eating enterprise we and to query RDFs nt and Security of r	eb appli nicro se	ications ervices		
Unit	Description						Duration	
1	1 <b>Distributed web Architecture</b> Middleware, Messaging, Security and interoperability in web architectures. RPC and RMI for distributed web communication.							
2	2 Service Oriented Architecture Introducing SOA- SOA triangle, layered architecture of SOA, Service messaging, service discovery, BPO - Business Process Outsourcing - Web service composition and coordination. Orchestration and Choreography.							
3	Building SOA Web service creation and accessing –XML, JSON, WSDL, SOAP, UDDI, XML, Restful web services, BPEL.							
4	Semantic Web: Mashup, Semantic Web Services, Metadata with RDFS Framework, Ontology, Owl, Logic for semantic web, SPARQL.							
5	Micro services: Testing, Monitor	Evolution, ing, Security	Modelling . Implemer	services, Integrat ntation of micro ser	ion, D vices.	eployment,	06	
	Total						30	
<b>Text B</b> 1. 2.	<b>Books</b> Allemang, and Ja RDFS and OWL, Sam Newman, B	ames Hendle 2 <sup>nd</sup> Edition, 1 <i>uilding Micr</i>	er., Semantic Morgan Kan 9 Services, 2ª	Web for the Working ufmann, 2011. <sup>nd</sup> Edition, O'Reilly,	g Ontolo 2021.	ogist: Effective	e Modeling in	
Refere	ence Books	<u></u>						
1. 2.	Tarek Ziade, <i>Pyt</i> Thomas Erl, <i>Se</i> Pearson Education	hon Microser rvice-Oriente on, 2005. (Cl	vices Develop dArchitectur assic Book)	pment, 1 <sup>st</sup> Edition, C re: Concepts, Technol	DReilly logy, at	publication, nd Design,	2017. 1st Edition,	





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# Laboratory Work

8 to 10 programming exercises based on the syllabus.

Signature (Head of the Department)



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Course	e: AI and Robotic	CS		Code: 702IT0E013			
	Teaching Scheme			<b>Evaluation Scheme</b>			
Lectu (Hou per week	re Irs (Hours k) per week)	Tutorial (Hours per week)	Credit	Internal Contin Assessment (I (Marks- 50)	uous CA) )	Tern Examinat (Mark	n End ions (TEE) cs- 100)
2	2	0	3	Marks Scaled t	o 50	Marks Sc	caled to 50
Pre-ree	quisite: Program	ming for Pro	oblem Solvii	ng			
Course To ena combir and Lc Course	e Objective able students to h nation of machine ogical techniques, e Outcomes	ouild intellig learning an learning tec	gent machin d Robotics. hniques and	nes, software, or aj This course discuss d Robotics fundam	pplicati ses AI n ental.	ons with a c nethods inclu	cutting-edge ading search
After c 1. 2. 3.	completion of the Describe basic p representation, a Explain and imp Apply knowledg developing solut	course, the s rinciples of A and learning plement adva ge of robotic tions to real	tudent will AI toward p nce AI lear s, robot Kin time proble	be able to - problem solving, in ning techniques ematics, robotic pr ms	ogrami	, perception, ning and rol	, knowledge bot vision in
Detail	ed Syllabus						Duration
1.	<b>Introduction to</b> History, Scope, Space Search, He	AI agents, Env euristic Searc	vironment, ch, Game Tr	Automated Probl ee Search.	em Sol	ving, State	04
2.	<b>Logic and Dedu</b> Propositional lo Constraint Satisf	<b>ction</b> gic, Predica faction Probl	te Logic Fı ems.	undamentals, Reso	olution	Refutation,	05
3.	<b>Learning</b> Machine Learnir Deep Learning F	ng Fundamen Fundamental	ntals, Learn s, Reinforce	ing Decision Trees, ement Learning Fu	, Neura ndamer	l Networks, ntals.	06
4.	<b>Introduction of</b> Definition of a probot based on Terminologies upplications.	04					
5.	Robot Kinemati	cs and Dyna	amics				05
	Homogeneous parameters, use equation of robo robotic configura	co-ordinates e of Denav otic arms, for ations.	and co-o it-Hartenbe ward and in	ordinate transform rg representation nverse kinematics	nations, for fi for basi	kinematic nding arm c industrial	Arosan
6.	Robot Vision an	nd Programm	ning				ROGIS
Cat	el s					CO WUMBAL56	V L Meht Vile Parle Mumbai-4

#### **Text Books**

- 1. Stuart Russell and Peter Norvig, *Artificial intelligence: A Modern Approach*, 4<sup>th</sup> Edition, Prentice Hall, 2020.
- 2. Saha S K, *Introduction to Robotics*, 2<sup>nd</sup> Edition , McGraw Hill Higher Education, New Delhi, 2014.

#### **Reference Books**

- 1. M.P. Grover and N. G. Odrey, *Industrial Robotics: Technology, Programming and Applications*, 2<sup>nd</sup> Edition, TMH Edu. India, McGraw Hill India, 2017.
- 2. Kevin Warwick, Artificial Intelligence: The Basics, 1st Edition, Taylor and Francis, 2013.

### Laboratory Work

8 to 10 programming exercises based on the syllabus.



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Program: B Tech/MBA Tech Information Technology     S						Semester : V		
Course · Advanced Computer Networks Code · 702IT0E015								
Course	Teaching Scheme Evaluation Schem							
Lectur (Hour per week	re rs (Hours per week)	Tutorial (Hours per week)	Credit	Internal Contin Assessment (I (Marks- 50)	uous CA)	Term End Exa (TEE (Marks-	minations E) 100)	
2	2	0	3	Marks Scaled t	o 50	Marks Scal	ed to 50	
Prereg	uisite: Compute	r Networks	_					
Course The obj focus of attention about of	e Objective jective of this cou on top-down app on to both princ computer networ	urse is to fami proach, the I iples and pr rking.	iliarize stu nternet ar actice, and	dents with the wo ad a modern treat d its accessible sty	rking c ment c vle and	f internetworks. of computer netv approach towa	This course working, its rd learning	
Course	e Outcomes							
After c 1. I 2. I 3. C 4. H	Completion of the Describe medium Design IP addres protocols Compare and and Explain various r	course, the s n access layer ssing scheme alyze transpo nultimedia p	er protocols e, analyze ort protocols, i	III be able to - packet forwardin ols and other key p nternet security co	ng, and protocc	compare differ ols essential for n s and future netv	ent routing etworking vorks	
Unit	Description						Duration	
	Modium access	laver					<u>01</u>	
1.	Channel allocat TDM, CDMA, N	tion problem MACA.	, hidden 1	node and exposed	node	problem FDM,	03	
2.	<b>Internet protoc</b> IPv4, compare I IPv4 to IPv6; su	<b>ol</b> IPv4 and IPv Ibnetting clas	6, IPv6 - (a ssless addı	address, special ad ressing).	dress,	transition from	05	
3.	Network Layer Routing tables and Border Gat	and forward eway Protoc	ing, Routi ol, DHCP,	ng protocols - Op Mobile IP, AODV	en Sho 7.	ortest Path First	06	
4.	<b>Transport layer</b> Transmission C TCP.	r Control Proto	col - Reno	o, SCTP, I-TCP, Sr	юор Т	CP and Mobile	06	
5.	<b>Multimedia in</b> SIP, QoS (flow o	<b>the internet</b> classes, flow o	control to	improve QoS - FIF	O, Pric	ority and WFQ).	03	
6.	<b>Network secur</b> Introduction to security (SSL ar	ity Internet sec nd TLS), IPSe	urity - ap ec, VPN, F	plication layer sec irewall, WPA2, W	curity, PA3.	transport layer	05	
7.	Introduction to networks and 5	o Internet o G.	of Things	and application	ns, sof	tware defined	02 Arm	
Text P	lotal						30	
1 ext B 1. 2.	<b>ooks</b> Behrouz A. Ford James F. Kurose Pearson Educat	ouzan, TCP/I and Keith W ion, 2017.	P Protocol I. Ross, Co	suite, 4 <sup>th</sup> Edition, M mputer Networking	McGrav :: А Тор	w Hill Education	REGI , 2047, KM's 7th Edition Vile Par	
Pate	01 500					CO MOL	Mumbai-	



#### **Reference Books**

- 1. Behrouz A. Forouzan and Firouz Mosharraf, *Computer Networks: A Top-down Approach*, Special Indian Edition, McGraw-Hill, 2012.
- 2. Jochen Schiller, *Mobile communication*, 2<sup>nd</sup> Edition, Pearson Education, 2008.
- 3. Comer D., Internetworking with TCP/IP Volume-I, 6th Edition, PHI, 2015.
- 4. Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, 1st Edition, Wiley, 2015.

# Laboratory Work

8 to 10 programming exercises based on the syllabus.

Arosal





Progra	m: B Tech/MBA Te	ology Se	Semester : VII				
Course	e : Information Syst	ems Security		Ca	ode: 7021T0C02	29	
	Teaching Scheme Evaluation Scheme						
Lect (Hour wee	rure Practical (Hours ek) per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Ex (TE (Marks	aminations E) - 100)	
2	2 2	0	3	Marks Scaled to 50	Marks Sca	led to 50	
Prereq	uisite: Basic Know	ledge of Com	puter Net	work, Operating Syste	ems and progra	mming.	
Course This co will lea variou	e Objective ourse introduces stu arn about various cy s aspects of cyberse	udents to the ybersecurity t ecurity.	various ele hreats and	ements of informatior I their countermeasure	n systems securi es. Students will	ty. Students l learn about	
Course	e Outcomes						
After c 1. 2. 3.	completion of the co Analyze various c Explain various se Describe various e	ourse, student ybersecurity t curity techno ethical and leg	t would be threats and logies and gal issues r	able to- d countermeasures l mechanisms related to cybersecurit	у		
Unit						Duration	
1	Introduction						
1	Basic Component controls, goals of Cybersecurity Fra	ts of Cyberse f security, Se mework, MIT	ecurity, vu ccurity Sys TRE ATT&	ulnerabilities, threats stem development li CK® Matrix	, Attacks and fe cycle, NIST	4	
2	<b>Design Principles</b> Various security th APT, social enginerinciples, security	hreats and att neering, etc.) y policies, typ	acks (non- ), threat a pes of secu	malicious program er actors, method of d rity policies	rors, malwares, efence, design	4	
3	<b>Cryptography</b> Cryptography bas ciphers, cryptogr management and cryptosystems.	sics, transposi aphic algori distribution,	tion and st thms (AE digital sig	ubstitution ciphers, st S and RSA), Diffie gnature, hash functic	ream and block -Hellman, key ons, Attacks on	5	
4	<b>Identity and acces</b> Authentication ba biometric authe Authentication, at DAC, MAC, and control models, id	ss manageme sics, Passwor entication, H ttacks on auth Role based entity and ac	nt(IAM) ds, authen Kerberos, nentication Access Co cess provis	tication tokens, certifi SSO approaches, schemes, Access con ontrol, Identify Feder sioning lifecycle.	icate based and Multi-Factor Itrol principles, rations, Access	5	
5	<b>Security Technolo</b> Firewalls, Kinds o (Default allow, I Prevention System	<b>ogies</b> of Firewalls, F Default Deny ns, types of II	filtering Se ) on pro DPS, Virtua	ervices, DMZ, Implem xy, NAT, Intrusion al Private Network, SS	nenting policies Detection and SH	Aroral	
Pat Ser SVK Mur Au	el School (M'S 1000 mbai i6				THIS NAME TO MUNEAUSS OF N	REGISTR VKM's NM / L Mehta R /ile Parle (W fumbai-400 (	

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B Tech I.T./Sem VII/A 2023-24/Page 1

6 <b>Risk and Incidents Management</b> Overview of risk management, risk identification and assessment, risk control strategies, selecting risk control strategy, continuity strategies (Business continuity planning, Incident response planning, Disaster Recovery planning)	4
7 <b>Legal and Ethical issues</b> Cybercrimes and criminals, IP, privacy, legal and ethical issues.	3
Total	30

#### **Text Books**

1. M. Whitman and H. Mattford, Principles of Information Security with MindTap, 6<sup>th</sup> Edition, Cengage, 2018.

#### **Reference Books**

- 1. C. Pfleeger, S. L. Pfleeger and J. Margulies, Security in Computing, 5th Edition, Pearson Education, 2018.
- 2. B. Forouzan, D. Mukhopadhya, Cryptography and Network Security, 4th Edition, McGraw Hill, 2019.
- 3. W. Stallings and L. Brown, *Computer Security: Principles and Practice*, 4<sup>th</sup> Edition, Pearson Education, 2019.

# Laboratory Work

8 to 10 Programming exercises based on the syllabus.

And





Progr	am: B Tech/MBA							
Cours	se: Software Testir	ıg			Code:	702IT0E035	6	
	Teachin	g Scheme		E	valuati	on Scheme		
Lect (Hor pe wee	ure urs r (Hours r k) per week)	Term Examinatio (Marks	m End tions (TEE) ks- 100)					
2	2	0	3	Marks Scaled	to 50	Marks Sca	aled to 50	
Pre-re	equisite: Software	e engineering	5.					
Course To lea Quali the de softw	<b>Se Objective</b> arn traditional tes ty and security of evelopment life cy are products.	sting method software pro cle. It will er	ls applied to oducts rests o nable the stud	develop robust s n early error dete ents implement r	softwar ection a nanual	e products ar nd reporting and automate	nd services. throughout ed testing of	
Cours	se Outcomes							
After	completion of the	course, stud	lent would be	able to-		antin a		
1. 2	Design and imp	iement test c	ases for different automatic	testing for diffor	pes of t	esting fules of softwar	are	
3.	Apply test-drive	en developm	ent to improv	ve testing and del	iverv ir	a software dev	velopment	
Detai	led Syllabus		F					
Unit	Description						Duration	
1	<b>Introduction to</b> Testing objective Defects, Failures	<b>Software Te</b> es and activi 5.	e <b>sting</b> ties. Traditio	nal and Agile tes	ting pro	ocess. Errors,	4	
2	<b>Testing Technic</b> Black-Box Test Analysis (BVA)- Effect Graphing White-Box Test Graph matrices-	<b>ques</b> ing Technic State Transi Based Testir ing Techniq Loop testing	ques- Equiva Ition Testing-I ng - Error Gue ues- Logic C g-Data flow te	alent Partitionin Decision table ba essing Coverage criteria sting-Mutation te	ig-Bour sed Tes -Basic <sub>]</sub> esting	ndary Value ting - Cause- path testing-	6	
3	Unit Testing & Integration Testing       6         Unit testing framework, Naming and structuring Test Cases, Specification-based Testing Techniques. Integration test techniques, Data Requirement, Planning							
4	<b>System Testing</b> , Test techniques,	<b>User accept</b> Data Requir	t <b>ance Testing</b> rement, Plann	<b>&amp; Regression T</b> o	esting		6	
5	Test & Behavior Driven Development     8       Classic Style, Mockist Style     0							
	Contemporary 1	ssues: Appli	ications of 501	itware resting in	mausti	у	20	
							30 RECIS	<b>FD 4 -</b>
Text I           1.         F           2         A           V         V	<b>300KS</b> Paul C. Jorgensen, 5 021 Mexander Tarlind Vesley, 2016.	Software Testi er, Developei	ing: A Craftsm <sup>r</sup> Testing: Buil	an's Approach, 5 <sup>th</sup> Iding Quality inte	Edition	, Auerbach Pu vre, H <sup>1</sup> Edition	ablications,s 1 V L Menta Addisonric Mumbai-40	NMIM a Road, (West), 00 056.



#### **Reference Books**

- 1. Richard Lawrence, Paul Rayner, *Behavior-Driven Development with Cucumber: Better Collaboration for Better Software*, 1<sup>st</sup> Edition, Addison-Wesley, 2019.
- 2. Jez Humble, David Farley, *Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation,* 1<sup>st</sup> Edition, Addison-Wesley, 2010.

### Laboratory Work

8 to 10 Programming exercises based on the syllabus.

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Program: B Tech MBA/Tech Information Technology,         Semester: VII										
B Tech/MBA Tech Computer Engineering										
Cours	e: Ethical Hackin	g		Code: 702	IT0E028					
	Teaching	Scheme	Γ	Evaluation Scheme						
Lectu (Hou per weel	re Practical (Hours r k) per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Exa (TEI (Marks-	aminations E) - 100)				
2	2	0	3	Marks Scaled to 50	Marks Scal	led to 50				
Pre-re	Pre-requisite: Computer Network, Operating Systems and programming									
Cours This c learn variou	e Objective course is an intro about various m us attacks in the l	duction to v ethods, tool ab environm	vulnerability s and techn nent.	y assessment and penetra iques to perform ethical	ation testing. St hacking and w	udents will ill simulate				
Cours	e Outcomes		1. 11	1 11 .						
After	completion of the 1. Demonstrat 2. Describe va 3. Describe va	e course, stud e hacking in rious counte rious profes	dent would a lab envir ermeasures sional, ethic	be able to- onment cal and legal issues related	l to ethical hack	ing				
Detail	led Syllabus									
Unit	Description					Duration				
1	<b>Introduction</b> Need for advers process, types o (OSSTMM, PTE	arial thinkin of hackers, t S, and OWA	ig and pene ypes of per SP Testing	tration testing, ethics of ha netration testing, testing Guide), and Rules of eng	ocking, hacking methodologies agement.	6				
2	<b>Reconnaissance</b> Introduction, ty engineering, we hacking etc.), c network scannin	e and scanni ypes of rece b based rece ountermeas ng, and vuln	i <b>ng</b> onnaissance on, DNS ba ures, scann uresbility sca	e, various techniques of sed recon, network based ing, types of scanning ( anning), Sniffers	recon (social recon, Google port scanning,	8				
3	<ul> <li>3 Exploitation</li> <li>Bassword cracking, spoofing, session hijacking, DoS / DDoS, Buffer Overflow, malware, evading firewall and IDS, SQL Injection, OWASP top 10 web application vulnerabilities, hacking wireless networks, metasploit, meterpreter, AV evasion, metasploit databases and tool integration, privilege escalation</li> </ul>									
4	Hacking Mobil Overview of and	<b>e platforms</b> droid and iC	DS, OWASP	mobile to 10 risks and m	itigation.	2				
5	<b>Legal, Professio</b> Cyber laws in Ir penetration test	onal and Eth ndia, various ing report w	n <b>ical issues</b> s ethical dile rriting	emma, professional condu	act, and	2				
6	Case Study					2				
	Total					30				
Text E	<b>Books</b> . R. Pillay, <i>Learn F</i>	Penetration Tes	<i>ting,</i> 1 <sup>st</sup> Editic	on, Packt Publication, 2019.	P	Helde				



B Tech I.T./Sem VII

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Vile Parle (West), Mumbai-400 056. Page 5

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2. M. Walker, CEH Certified Ethical Hacker All-in-One Exam Guide, 4th Edition, McGraw-Hill Education, 2019.

#### **Reference Books**

- 1. N. Jaswal, Mastering Metasploit, 4th Edition, Packt Publication, 2020.
- 2. S. Oriyano and M. Solomon, *Hacker Techniques, Tools, and Incident Handling,* 3<sup>rd</sup> Edition, J B Learning, 2020.
- 3. Gilberto Najera-Gutierrez, Juned Ansari, Daniel Teixeira, and Abhinav Singh, *Improving your Penetration Testing Skills*, 1<sup>st</sup> Edition, Packt Publication, 2019.

# Laboratory Work

8 to 10 Programming exercises based on the syllabus.

Aros





Program:	Program: B Tech/MBA Tech Information Technology       Semester: VII							
Course: N	etwork design	n			Code:	702IT0E03	36	
	Teaching	Scheme		Eva	aluation	n Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal ContinuousTernAssessment (ICA)Examinat(Marks - 50)(Mark			n End tions (TEE) ks- 100)	
2	2	0	3	Marks Scaled t	o 50	Marks S	caled to 50	
Pre-requi	site: Compute	r Networks						
Course O The course design us Understau resources Course O After com	bjective se focuses on ing the latest t nding the suff can be learnt. utcomes pletion of the	designing, s technology a ficient Oper course, stud	specification and devices ations, Adr ent would l	n, and implement a , while understand ninistration, Manag be able to-	a mode ing hov gement	ern, large sc v to secure f , Provisioni	rale network the network. ng, network	
I. Expla	in the major a	ipplication a	rchitectures	, and applicable star	nuarus	of networks	5	
2. Desig	n and manage	e computer 1	network sys	stems	ام	000 m of 1		
3. Demo	ibo hour poter	gical design	process for	core, distribution, a		ess network	s	
4. Desci	ribe now netw	ork monitor	ing and ala	rm reporting influe	nces the	e network d	esign	
Detailed	Syllabus							
Unit I	Description						Duration	
1 In	troduction						3	
Ar Pe ne	nalyzing the t rformance def twork traffic,	echnical goa initions, ma understandi	als of netwo king netwo ng various s	ork, scalability, ava rk design, tradeoffs standards.	ailabilit charac	y, network terizing the	J	
2 Ch Ch log av sw an Ch Te ser vo Se	aracterizing the aracterizing the aracterizing the aracterizing the ailability and which are the aracterizing the aracterizin	the Existing the network is ure, network network ut thet networks ne. Network Tra raffic flow, c affic flow, d tworks, cha nents.	Internetwo nfrastructur k addressin ilization, ne analyzing fic lient/server istributed c racterizing	rk re, network map, la ng and naming, a etwork accuracy, an g network efficiency r traffic flow, peer-t computing traffic fl traffic load, charact	rge inte nalyzing alyzing , analy o-peer ow, tra terizing	ernetworks, ag network g errors on zzing delay traffic flow, ffic flow in Quality of	6	
3 Lo De To Sp action	gical Networl ssigning a netw pologies, flat 1 anning tree pr cess points, de pologies.	k Design work topolog LAN topolog cotocol, virtu esigning the	gy, hierarch gies, redunc ial LANs, w enterprise e	ical network desigr dant network desigr vireless LANs, redu edge topology, secu:	n, flat W n topolo ndant v re netw	'AN ogies, vireless ork design	Arosal	
4 De	esigning Mod	els for Addı	essing and	Numbering			REGISTRA SVKM's NMI	
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	Network layer addresses, IP dynamic addressing, IP version 6, zero configuration networking, hierarchical routing, route summarization (aggregation), discontiguous subnets, mobile hosts, link-local addresses, global unicast addresses	
5	Selecting Switching and Routing Protocols Portfast, uplinkfast and Backbonefast, Unidirectional link detection, dynamic trunk protocol, distance-vector routing protocols, hierarchical versus Non hierarchical routing protocols, IP routing, border gateway protocol, integrated routing and bridging.	4 - l
6	<b>Testing, and Optimizing the Network Design</b> Testing your network design, optimizing your network design.	2
7	<b>Developing Network Security Strategies</b> Network security design, security mechanisms, modularizing security design, securing wireless networks, authentication in wireless networks.	3
	Total	30
Tex	tbooks	
	1. Behrouz A. Forouzan, <i>Data Communications and Networking</i> , 5th Edition, McG Education, 2017.	raw-Hill
	2. Michel Thomatis, <i>Network Design Cookbook: Architecting Cisco Networks</i> , Versi Edition, Cisco press, August 2016.	on 10.2.8, 1 <sup>st</sup>
Ref	erence Books	
1.	Russ White, Denise Donohue, Art of Network Architecture, The: Business-Driven D	esign
	( <i>Networking Technology</i> ) Cisco press, 1 <sup>st</sup> Edition, 2014.	
2.	Priscilla Oppenheimer, Top-Down Network Design, 3rd Edition, Cisco Press, 2011.	
Lab	oratory Work	
8 to	10 Programming exercises based on the syllabus.	

Signature (Head of the Department)

Arosal





Progra Tech/	<b>m:</b> B MBA T	Tech/MBA Tech (Comp	Tech Info	ormation T eering), B	Technology, B Tech Artificial	Semeste	er: VII,VIII		]
Intellig	gence, H	3 Tech EXTC	C, MBA Tech	EXTC					
Cours	e: Clo	ud Comput	ing			Code: 7	02IT0C026		-
		Teaching	Scheme			Evaluatio	on Scheme		-
Lect (Hou	Lecture (Hours per per per per Credit		Credit	Internal Con Assessment	Internal Continuous Tern Assessment (ICA) Examinat			n End ions (TEE)	
we	week) week) (Marks - 50) (Mar				(Mark	ts- 100)	_		
2	2	2	0	3	Marks Scale	ed to 50	Marks Sc	caled to 50	_
Pre-re Cours The contechnol delves empha	quisite: e Objec ourse i ologies a into o osises o	: Computer : c <b>tive</b> s designed and applicat concepts, p: n business n	Networks to enable tions. This co rocesses an podels risk	students to ourse cover d best pra managemen	o understand s basic models, actices needed nt and service n	state-of-th architectu to secure panageme	ne-art cloud ure, virtualisa e cloud info ent aspects of	computing ation. It also ormation. It cloud	
Cours	e Outco	omes							Ν
After o	complet	tion of the co	ourse, stude	nt would be	e able to-				
1. ว	Classi	ty the layers	s of cloud ref	terence mod	tel based on the	eir signific	cance		
∠. Detail	ed Svll	abus		a orchestiat	ion in ciouu en	viroriitiefi	ι		
Unit	Desc	ription						Duration	-
1	Introd Essent Mode buildi	<b>luction to C</b> tial Characte ls, Cloud Se ng Cloud In	<b>loud</b> eristics of Cl rvice Broker frastructure	loud, Cloud age, Cloud	l Service Model Reference Mod	s, Cloud el, Consid	Deployment lerations for	5	
2	Physic Comp	<b>cal Layer</b> oute System,	Storage Sys	tem Archite	ecture, Network	< Connect	ivity	5	
3	<b>Virtua</b> Virtua Resou	<b>al Layer</b> Il Layer Fur rces	nctions, Virt	ualization S	Software, Resou	urce Pool	and Virtual	5	
4	Contr Contr	<b>ol Layer</b> ol Layer Fur	nctions, Cont	trol Softwar	e, Resource Opt	timizatior	n Techniques	5	1
5	Cloud Threa	l <b>Security</b> ts, Security 1	Mechanisms	s, IAM solut	tions, Security A	Algorithm	S	5	1
6	Orchestration       5         Container Approach, Docker Container, Items in a Dockerfile, Kubernetes       5         Pods, Kubernetes Terminology, Kubernetes Cluster Model, Kubernetes       6         Features       6							l	
	Total							30	
<b>Text B</b> 1.	<b>books</b> Doug Editio	las E. Come on, Taylor a	er, The Cloud nd Francis, 2	Computing	Book: The Futur	e of Compi	iting Explaine	REGIS dSIVKM's V L Meht Vile Parlo	TR/ NM a Ro
							OO MUMBAI-56	Mumbai-4	00 0



2. Tim Mather, *Security and Privacy Trends in Cloud Computing and Big Data*, 1<sup>st</sup> Edition, Taylor and Francis, 2022.

#### **Reference Books**

- 1. Umang Singh, San Murugesan and Ashish Seth, *Emerging Computing Paradigms Principles*, *Advances and Applications*, Wiley India, 2022.
- 2. Sanjiva Shankar Dubey, *Cloud Computing and Beyond: A Managerial Perspective*, 2<sup>nd</sup> Edition, Wiley, 2021.
- 3. John R. Vacca, *Cloud Computing Security Foundations and Challenges*, 2<sup>nd</sup> Edition, CRC Press, 2021.
- 4. Brij Gupta, Gregorio M, Dharma P Agarwal and Deepak Gupta, *Handbook of Computer Networks and Cyber Security*, 1<sup>st</sup> Edition, Springer, 2020.

Laboratory Work

8 to 10 Programming exercises based on the syllabus.

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Progra	<b>am:</b> B Te	ech/MBA	Tech Inform	nation Tech	nology	Seme	ster: VII		
Cours	e: Adva	nced Mac	hine Learnir	ıg		Code	:702IT0E037	,	-
	r	Teaching	Scheme	0	Ev	aluatio	on Scheme		
Lectu (Hou per weel	ure irs r k)Practical (Hours per week)Tutorial (Hours per week)Internal Continuous Assessment (ICA)Te 					Term Examinati (Marks	End ons (TEE) 5- 100)		
2		2	0	3	Marks Scaled t	o 50	Marks sca	led to 50	
Pre-re	equisite:	Engineer	ring Mathem	natics – III a	nd IV				
Cours The ol	e Object biective	<b>tive</b> of this co	urse is to en	able studer	nts to understand a	ind apr	olv advanced	concepts in	
machi	ine learn	ing to rea	l life problem	ns.		ina apr	jij udvulleeu	concepto in	
Cours	e Outco	mes	1						-
After o	completi	ion of the	course, stud	ent would	be able to-				
1. E:	xplain a	dvanced o	concepts in r	nachine lea	rning				
2. M	lap real	world pr	oblems to a	machine le	earning problem d	efinitio	n and select a	appropriate	
m	nachine l	learning a	lgorithm		01			II I	
3. D	)esign ar	oplication	s using mach	nine learnin	g techniques				
4. E	valuate	the perfor	mance of the	e applicatio	ns				/
Dotail	lod Sulla	huc			-				-
Unit	Descr	rintion						Duration	-
1	Ovorvi	inputon ione of MI	conconte						
	Superv Inform	vised and ation theo	unsupervisory, Linear A	ed methods Algebra	s Probability theor	ry, Dec	ision theory,	4	
2	Concep Models Polyno local re	ot Learnir s (HMM), omial regr egression,	ng, Minimum Generalized ession, step generalized	n Descriptio l Linear Mo functions, re additive m	on Length (MDL),H dels, extensions of egression splines, s odels (GAMs)	idden linear moothi	Markov models ing splines,	6	
3	<b>Graph</b> Bayesia Carlo S	<b>ical Mode</b> an Belief I Simulation	e <b>ls</b> Networks, PA	AC Learnin	g, SOM, VC-Dimer	nsion a	nd Monte	4	
4	<b>Geneti</b> Hypoth learnin	i <b>c Algorit</b> hesis spac	<b>hms</b> e search, Ge	netic progra	amming, Models of	fevalua	ation &	5	
5	<b>Reinfo</b> Q Lea learnin	orcement l arning, N ag, Genera	Learning Ion-determir Ilization, Act	nistic rewa	rds & actions, T ng, Metric Learning	empora	al difference	5	
6	Deep I Single recurre	L <b>earning</b> and mu ent neural	<b>overview</b> lti-layer networks, w	ural netwo vhen to use	orks, convolutiona deep learning	l neur	al networks,	3 Aroson	L
7	ML cyl	bersecuri	ty applicatio	n				3	
Patient SVA	te/ somool						ANS NAME OF CONTRACT OF CONTRACT.	SVKM's V L Meht Vile Parle Mumbai-4	NMIM NMIM a Road (West) 00 056.





	When to use anomaly detection versus supervised learning, intrusion detection with heuristics, data-driven methods, feature engineering for anomaly detection, anomaly detection with data and algorithms, challenges of using machine learning in anomaly detection, response and mitigation, practical system design concerns	
	Total	30
Text B	ooks	
1.	Andreas C. Müller & Sarah Guido, <i>Introduction to Machine Learning with Python: Data Scientists</i> , 1 <sup>st</sup> Edition, O'Reilly Media Inc, 2017.	A Guide for
2.	James, G., Witten, D., Hastie, T., & Tibshirani, R. An Introduction to Statistical Le	arning. , 2 <sup>nd</sup>
	Edition, New York: Springer, 2021.	
3.	Stuart Russel and Peter Norvig, Artificial Intelligence A Modern Approa	ch, Pearson
	<i>Education,</i> 4th Edition, 2010.	
Refere	nce Books	
1.	Alpaydin, Ethem. Introduction to Machine Learning, 4th Edition, MIT press, 2020.	
2.	Aurélien Géron. Hands-On Machine Learning with Scikit-Learn and TensorFlow,	2 <sup>nd</sup> Edition,
	O'Reilly Media, 2019.	
3.	Winder, Phil. Reinforcement Learning. O'Reilly Media, 2020.	
4.	Vasilev, Ivan. Advanced Deep Learning with Python: Design and implement adv	vanced next-
	generation AI solutions using TensorFlow and PyTorch. 1st Edition, Packt Publishing	g Ltd, 2020.
5.	Tom Mitchell, <i>Machine Learning</i> , 1 <sup>st</sup> Indian Edition, McGraw Hill, 2017.	
Labora	atory Work	
8 to 10	Programming exercises based on the syllabus.	
	Aron	d

REGISTRAR SVKM's NMIMS V L Mehta Road, Vile Parle (West), Mumbai-400 056.



Program	VII							
Course	Visual Analyti	ics			Code: 702	T0F039		-
course.	Teach	ing Scheme	•		Eva	luation Scheme	•	-
Lecture (Hours per week)	e Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal C Assessm (Mark	Continuous ent (ICA) cs - 50)	Term End Ex (TEE) (Mai	aminations ks - 100)	
2	2	Practical exa Marks Sca	amination led to 50					
Pre-reau	<b>uisite:</b> Basic con	mputer knov	wledge, D	ata Warehou	sing and Mir	ning		
Course	Objective	I · · · ·			0	0		
The obje using vis charts, n make be	ective of the cou sual representa naps etc., and etter, data-drive	urse is to fam ations of the thereby iden en decisions.	iliarize the data. The ntify patte	e students wi course helps erns and dev	ith tools and p s students to elop actional	processes to anal visualize the dat ple insights that	yze datasets ta in graphs, help one to	
Course	Outcomes		1.					
After co	mpletion of the	e course, stu	dent wou	Id be able to-				
1. 2.	Demonstrate a Create visuali	a working kı zation charts	nowledge 5 appropri	of data visua iate for the u	alization nderlying da	ta		
3.	Apply modern	n statistical l	earning te	echniques on	data visualiz	ations		
4.	Design and in	nplement in	teractive	links betwee	n various ob	jects in a data v	visualization	
	report							
Detailed	l Syllabus							
Unit	Description						Duration	
1	Getting Start	ed with Vis	ual analyt	tics			2	
			<i>.</i>	ico			4	
	What is data v	visualization	, methodo	ology for data	a visual analy	tics, Exploring	2	
	What is data v Visual Analy	visualization tics Concept	, methodo s, Using `	ology for data Visual Analy	a visual analy tics, Discuss	tics, Exploring ing the course	2	
	What is data we wanted with the weight of th	visualization tics Concept and scenaric	, methodo s, Using ` ).	ology for data Visual Analy	a visual analy rtics, Discuss	tics, Exploring ing the course	2	
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2 3 4 5 6 7	What is data we visual Analy environment Data investig Accessing data to find componenties of items, joining Using Visual Examining the data items pro- advanced ana Data visual a Modern statist Designing Re- Examining the with graphs, interactions, we objects. Viewing Visual Viewing reports of the state	visualization tics Concept and scenaric <b>ation and p</b> ta from local mon issues data items, tables/ colu- <b>analytics</b> to visual ana operties, crea- alytics. <b>analytics</b> stical learnin e Visual Ana- to visual Ana- working with ual Analytic rts on the W	, methodo s, Using reparation l device/ Data p applying umns, Dat cplorer alytics ex ating visu g techniqu Visual Ar alytics Des with filten gauges, s Reports eb, viewin	n server/socia reparation - g data sourc a exploration plorations, s alizations, Er ues on data v nalytics signer, creatin ers and rep working with	a visual analy vics, Discuss l media. Data cleaning, r e filter, crea- n with genera electing data nhancing visu <u>visualizations</u> ng a simple re- port sections n tables, work	tics, Exploring ing the course a investigation nodifying the ting new data ted dataset. . and defining nalization with eport, working , establishing ing with other vice.	3 3 4 8 <u>Accord</u> 2 <u>REGIST</u> SVK6M's 1	RAR
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# Total

30

- Text Books
  - 1. Kieran Healy, *Data Visualization: A Practical Introduction*, 1<sup>st</sup> Edition, Princeton University Press, 2018.
  - 2. Cole Nussbaumer Knaflic, *Storytelling with Data: A Data Visualization Guide for Business Professionals*, 1st Edition, Wiley, 2015.

# **Reference books**

- 1. Visual Analytics 7.5: User's Guide by SAS Institute (online SAS documents).
- 2. Trevor Hastie Robert Tibshirani Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction,* 2nd Edition, Springer, 2017.

#### Laboratory Work

8 to 10 Programming exercises (and a practicum) based on the syllabus.

Signature (Head of the Department)

Arno





Program	Program: B Tech/MBA Tech Information Technology       Semester: VII										
Course	e: Database Admini	stration			Code: 702	T0E038					
	Teaching Sch	ieme			Evaluatio	n Scheme	2				
Lectu (Hour	re Practical (Hours per	Tutorial (Hours	Credit	Internal ( Assessn	Continuous 1ent (ICA)	Te Examin	erm End nations (TEE)				
per w	eek) week)	per week)		(Mar	ks - 50)	(IVIA	rks - 100)				
2	2	0	3	Marks S	caled to 50	Marks	Scaled to 50				
Prereq	Prerequisite: Database Management System										
This control and inform	Course Objective This course is designed to provide knowledge for enabling database development, design, and implementation. At the end of the course, students would be able to implement information systems using DBMS technology.										
Course	e Outcomes			11.							
After c	completion of the co	urse, student	would be a	ble to-							
1. Des	scribe the fundame	ntals of Data	base Admi	nistration	hace convit						
2. Ana 3. De	sign Database bac	kup and reco	overv proce	edures, ap	ply perform	y ance tuni	ng operations				
Detaile	ed Syllabus			outer co, up	p-) p-1						
Unit	Description						Duration				
1	Database Overvi	ew and Arch	itecture				4				
	Introduction to d	atabase adm	inistration,	Database	memory str	ructures,					
	installation	S OI DDA, I	inpact of f	lewer tech	nology on I	JDA, DD					
2	Managing the da	tabase Insta	nce				2				
	Access database	instance, Mo	odify datab	ase initial	ization para	meters,					
	stages of database	e startup, ale	rt log ,repo	sitory and	data diction	nary					
3	User Access and	Database Se	curity				4				
	Managing user a	ccounts, Gra	nting and 1	revoking p	privileges, M	lanaging					
	user groups ,man	aging roles a	nd privileg	ges, query	ing role info	rmation					
4	Database File Ma	inagement		1		1	4				
	storing data (cr	i mes, Man eate, alter	maining a analyzing	ana monit querving	table info	nog mes,					
	Managing indexe	s and constra	aints, mana	ging scher	na objects						
5	Introduction to N	letwork Adr	ninistratio	n			4				
	Network design	consideration	ns, networl	k responsi	bilities for t	he DBA,					
	Network configuration, Oracle Net features, Oracle Net Stack										
	Architecture. Or	acle share	d server	Infrastr	ucture, a	dditional	Arosan				
	listeners.										





6	<b>Backup and Recovery</b> Backup terminology, instance recovery, control file, checkpoints, redo log files, archived log files, performing database backup, Oracle RMAN.	4
7	<b>Performing Database Recovery</b> Types of Database failure, types of recovery, Performing recovery operations, Backing the database, full vs incremental backups.	4
8	Performance TuningTuning methodology overview, General tuning concepts, Case Study:Remote Databases & Virtual DBATotal	4 30
Toxt B		

Text Books

1. Craig S Mullins, Database Administration: The Complete Guide to DBA Practices and Procedures, 2<sup>nd</sup> Edition, Addison Wesley Professional, 2013.

### **Reference Books**

- 1. Abraham Silberschatz, Henry Korth, S Sudarshan, "Database System Concepts, 7th Edition, McGraw-Hill, 2019.
- 2. Brian Peasland, Oracle DBA Mentor Succeeding as an Oracle Database Administrator, 1st Edition, 2019.
- 3. Bob Bryla, Kevin Loney, Oracle Database 12c The Complete Reference, Oracle Press, 2013.

# Laboratory Work

8 to 10 Programming exercises based on the syllabus.

Signature (Head of the Department)

Arno

REGISTRAR SVKM's NMIMS V L Mehta Road, Vile Parle (West), Mumbai-400 056.



Program: B	Tech Inform	ation Techr	ology, B	3 Tech Semester: VII					
CSE-Cybers	ecurity					10			
Course: Cap	stone Projec	ct							
	Teaching S	cheme	1	Evaluation Scheme					
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Inte	rnal Continuous Assessment (ICA) (Marks -50)	Term End Examinations (TEE) (Marks - 50)			
0	8	0	4	Marks Scaled to 50 Presentation and Viva Marks Scaled to 50					
*Practical ex	am will be	conducted	at school	level (No	on-University Examin	ation)			
Pre-requisit	e: Knowled	ge of all cor	e and elec	ctive cours	ses completed till 3rd	year.			
Course ObjectThe capstorstudents' leadthe requiredchallengingteamwork abroaden theCourse OuteAfter compl1. Select andresearch2. Formula3. Implemed4. Manage5. Summar	ective in project is practical an problems, d nd planning ir scope and comes etion of the appropriate gaps. te the different the proto a team proje- ize the topic	designed t essentially r d soft skills. lo a feasibil g. The stude learning in course, stud e problem s ent use case otype/proof ect. c into a tech	o provid equired h The coun ity study ents may different lents will tatement s/feasibl of conce nical repo	le a culmi nands-on e rse aims to and deve also work t domains be able to after revie e design r pt, test an	inating design experie experience to ensure the encourage students to elop written and oral of a in interdisciplinary a ) - ewing the literature ar nodel. d validate the results.	ence to the final-year nat they graduate with to think critically, solve communication skills, areas which will help and identifying the			
Syllabus A student is fabrication v verify feasib submit a rep simulation a examiners.	required to vork or a sim vility of impl port detailing and synthesi	carry out el nulation an ementation g the literatu s, work plan	aborated d synthes . At the en are review n and wo:	project w sis of a pro nd of the s w, design rk done a	ork. The project may l oblem/system, and de semester students will problem formulation, nd present his/her wo	be either design and velop algorithms and be required to analysis functional ork carried out before			



Arosal



Program	Program: B Tech / MBA Tech (Computer Engineering, Semester: VI / VI												
Intormat	ion Technolo	ogy, Artific	tial Intell	igence)	Caluz		1						
Course:	Jistributed (		5		Code:/	02CO0C034	Ł						
	Teaching	g Scheme	1		Evalua	tion Schen	ne						
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal ContinuousTernalAssessment (ICA)Examinal(Marks - 50)(Marks)		m End tions (TEE) <s -="" 100)<="" th=""></s>							
2	2	0	3	Marks Scaled	to 50	Marks S	caled to 50						
Prerequisite: Operating Systems													
Course C To intro support	Course Objective To introduce the concepts and design of distributed computing and algorithms that support distributed computing.												
Course (	Outcomes												
After cor	npletion of t	he course,	student v	will be able to -									
1. Ex	plain the bas	ic concepts	s of distri	buted computing	g								
2. Ap	ply the conc	epts of dis	tributed	computing to im	plement	various me	echanisms						
of	communicat	ion			•								
3. An	alyze variou	s approach	nes of syr	nchronization, m	utual exc	clusion, ele	ction						
alg	orithms and	fault toler	ant servi	ces									
4. Re	cognize diffe	erent kinds	of namir	ng and their imp	lementat	ion							
Detaile	d Syllabus												
Unit	Descriptio	n					Duration						
1	Introducti	on to Dist	ributed S	System			05						
	Definition	, Goals, E	xamples	of Distributed	System	-Internet.							
	System a:	rchitecture	s-central	ized architectur	re, dece	ntralized							
	architectu	e, hybrid a	architectu	ure, Client-Serve	er Model,	, Servers-							
	general de	sign issues	, server o	clusters, managir	ng server	clusters.							
2	Communic	ation					06						
	Basic RPC	operation,	RPC in	nplementation, R	RPC sem	antics in							
	presence of failures, RMI- Basics, Implementation, Case study-												
Java RMI, Message oriented communication-: transient and													
	persistent c	ommunica	tion.				2						

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	Mukesh Patel School of Technology Management and Engineerin	ıg			
	Stream oriented communication- support for continuous media,				
	streams and QoS, stream synchronization.				
3	Synchronization	06			
	Introduction, Physical Clock synchronization algorithms,				
	Logical clocks, event ordering, implementation of Logical				
	clocks, Lamport's logical clock algorithm, Vector clocks, Mutual				
	exclusion: Centralized, distributed and token ring mutual				
	exclusion algorithms, comparison of these algorithms.				
	Traditional election algorithm- Bully and Ring election				
	algorithm.				
4	Fault Tolerance				
	Introduction, Process resilience, Reliable group communication.				
5	Naming	05			
	Names, identifiers, and addresses, Flat naming , Structured				
	naming: name spaces and resolution, implementation of name				
	space, Case study- Domain Name System, Attributed based				
	naming- Directory services.				
	Total	30			
Text	Books				
1.	Andrew S. Tanenbaum, Distributed System: Principles and Paradigms, 3 <sup>1</sup>	<sup>rd</sup> Edition,			
	Pearson Prentice Hall, 2017.				
Refe	erence Books				
1.	George Couloris, <i>Distributed System: Concept and Design</i> , 5 <sup>th</sup> edition, Pea Education, 2009	arson			
2	Pradeen K Sinha Distributed Operating System IEEE Press Prentice Ha	ll of India			
۷.	Ltd, 1998.	in or man			
3.	Mei-Ling L. Liu, <i>Distributed Computing: Principles and Applications</i> , Add Wesley, 2004.	ison –			
Labo	oratory / Tutorial work:				
8 to	10 experiments (and a practicum where applicable) based on the syllab	us.			

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#### SVKM's NMIMS Mukesh Patel School of Technology Management & Engineering

<b>Program</b> Enginee	n: B Tech (Artific ering, Information	ial Intelligenc n Technology	e, Compu , Electron	iter ics &	Semeste	r: V/VII		
Telecon	nmunication Engi	ineering, AI a	nd ML)					
MBA 16	ech (Artificial Inte	elligence, Cor	nputer En	igineering,				
Course	Doop Loarning	)			Code: 70	2 4 10 008		
Course.	Teaching	Scheme			Evaluatio	n Scheme		
	Evaluation Scheme				т	. Г. I		
Lectur	re Practical	Tutorial		Internal Cor	ontinuous Ter		n Ena tions (TEE)	
(Hours	per (Hours	(Hours per	Credit	Assessmen	it (ICA)	Examinat	ions (TEE)	
week	() per week)	week)		(Marks	- 50)	(Mark	s - 100)	
2	2	0	3	Marks Scale	aled to 50 Marks Sc		aled to 50	
Prerequ	uisite: Machine Le	earning, Statis	stical Met	hods				
	Objections	~						
Course	Objective	a from dama an to		ام ماييمينيام ما امي	المنابع مرمينا	م امع مان م	and a stime of	
advonce	arse focuses on the		als of neur	notworks a	long with	a practical pe	erspective of	
short to	eu topics such as	their real we	al fieurai	networks, rec	urrent ne	ulai netwolk	s, and long	
Course		then real-we	nu appin					
After co	mpletion of the c	rourse, studer	nts will be	able to -				
1.	Explain the funda	amentals of de	ep learni	ng.				
2 4	Apply optimization	on and regular	rization fo	r tuning the n	arameters	of deep neur	al networks	
3 F	Suild convolution	al neural net	works arc	hitectures for y	various an	nlications		
	Apply recurrent n	eural networ	ks archite	ctures for vari	ous applic	plications		
Detaile	d Syllabus							
Unit	Description						Duration	
1	Introduction to	Deep Learni	ng				02	
_	What is deep learning, motivation for using deep learning, Applications					•		
	of deep learning in various domains.							
2	Neural Networ	·ks					08	
	Basics of Neural network, Perceptron, Multilayer perceptron,							
	Feedforward neural network, back-propagation, Activation functions,							
	Loss functions, Gradient descent for neural networks.							
3	Optimization and Regularization for Deep Learning					05		
	Stochastic GD, Mini Batch SGD, Momentum Based GD, Nesterov							
	Accelerated GD, AdaGrad, RMSProp, Adam, L1 and L2 Regularization,							
	Early stopping, drop out.							
4	Convolutional Neural Networks					08		
	Convolution operation, pooling, striding, convolution over volume,							
	parameters of	CNN, Full	y connee	cted network	s v/s C	NN, Deep	6	
	an pa	te/ Schoo				A	mont	



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	convolutional architectures: AlexNet, Inception Network, ResNet.	
	Transfer learning using CNN, Applications of CNN.	
5	Recurrent Neural Networks	07
	Vanilla RNN, Back-propagation through time, Vanishing and Exploding	
	gradients, Long Short-Term Memory (LSTM), Gated Recurrent Unit	
	(GRU), Applications of RNN.	
	Total	30

### **Text Books**

- 1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, *Deep Learning*, 1<sup>st</sup> Edition, MIT Press Book, 2017
- 2. Charu Agarwal, *Neural Networks and Deep Learning: A Textbook*, 1<sup>st</sup> Edition, Springer, 2018 **Reference Books** 
  - 1. François Chollet, Deep Learning with Python, 1st Edition, Manning Publication, 2017
  - 2. Aurelien Geron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow,* 2<sup>nd</sup> Edition, O'Reilly, 2019.

# Laboratory/ Tutorial Work

8 to 10 experiments (and a practicum where applicable) / based on the syllabus

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# SVKM's NMIMS Mukesh Patel School of Technology Management & Engineering

Program	: B Tech Compu	n / MBA Teo Iter Enginee	ch [EXTC/ I ering/ Comr	nformatio outer Scier	n Technology/ nce/ CSE(DS)-311(VT)]	Semester	:V/VI/VII
Computer Engineering/Computer Science/CSE(DS)-511(V1)]         Course : Image and Video Processing					<b>Code :</b> 70	C <b>ode :</b> 702EX0E004	
	Teaching Scheme Evaluation Schem					ion Scheme	
Lectu (Hours wee	ture rs per ek) (Hours (Hours (Hours Credit Assessment (ICA) week) week) (Marks - 50) (Marks - 10)		Ter Examina (Mar	rm End ations (TEE) rks - 100)			
2 2 0 3 Ma		Marks Scaled to 50	Marks S	Scaled to 50			
Pre-requ	isite: Si	gnals and S	ystems, Disc	crete Time	Signal Processing		
Course C This cou picture p processi	<b>Objectiv</b> rse intro processir ng doma	e oduces conco ng. It also ho ain.	epts, methoo elps to devel	lologies ar lop a found	nd performance metrics lation for further study	for still imag and researc	ge and motion h in the signal
Course C	Outcome	2 <b>S</b>	_		_		
After con 1. A 2. A 3. In 4. Ex 5. Ill	npietion pply spa nalyze v terpret t valuate s ustrate v	of the cour atial domain arious frequ he use of va segmentatio video proce	se, students enhanceme aency doma arious morp n technique ssing	will be ab ent techniq in transfor hological o s for objec	ues on grey images ms to process an image operations on images t detection		
Detailed	Syllabu	15					
Unit	Descri	iption					Duration
1.	Image fundamentalsBasics of sampling and quantization, representing digital image, spatial and gray level resolution, basic relationships between pixels.					02	
2.	<b>Image enhancement</b> Point processing techniques - digital negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transformation, power law transformation, neighborhood processing-smoothing spatial filters, sharpening spatial filters, histogram processing-histogram equalization.					06	
3.	<b>Image transforms</b> Walsh transform, Hadamard transform, discrete cosine transform.					06	
4.	Morphological image processing Dilation, erosion, opening, closing, Hit–or-Miss transformation, basic morphological algorithms- boundary extraction on binary images, skeletonization, thinning, thickening.				05		
5.	Image Detecti and b thresho and me	segmentati ion of disco oundary d olding, regi erging.	on ontinuities- j etection us on based se	point, line ing local gmentation	and edge detection, e processing, segmenta n- region growing, regi	dge linking tion using on splitting	REGISTR
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6.	<b>Fundamentals of digital video</b> Video representation- digital video sampling, temporal correlation, video frame classifications, I, P and B frames, digital video quality measure.	02					
7.	<b>Digital video processing techniques</b> Fundamentals of motion estimation, motion estimation algorithms- exhaustive search block matching, 2D-log search method and 3 step search method.	03					
	Total	30					
Text Boo	Text Books						

- 1. R.C Gonzalez and Richard Woods, *Digital Image Processing*, Pearson publication, 4<sup>th</sup> Edition, 2018.
- 2. Ling Guan, Multimedia Image and Video Processing, CRC Press, 3rd Edition, 2017.

# **Reference Books**

- 1. Bernd Jehne, *Digital Image Processing and Image Formation*, Springer, 6th Edition, 2022.
- 2. Wilhelm Burger and Mark J. Burge, *Digital Image Processing: An Algorithmic Introduction*, Springer publications, 2<sup>nd</sup> Edition, 2022.

# Laboratory Work

8 to 10 practical exercises (and a practicum) based on the syllabus.

Signature (Head of the Department)

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Program: B Tech/MBA Tech Information Technology     Set						Sei	Semester : VII	
Cours	e : Infoi	mation Syste	ems Security			Со	de: 7021T0C02	29
		Teaching S	Scheme		Eva	alua	tion Scheme	
Lect (Hour we	ture rs per ek)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA (Marks - 50)	A) Term End Examinations (TEE) (Marks- 100)		aminations E) - 100)
r 4	2	2	0	3	Marks Scaled to	50	Marks Sca	led to 50
Prerec	quisite:	Basic Knowl	ledge of Com	puter Net	work, Operating S	yste	ms and program	nming.
Cours This co will le variou	e Objec ourse ir arn abo is aspec	<b>ttive</b> htroduces stu ut various cy ts of cyberse	idents to the bersecurity t curity.	various ele hreats and	ements of informat l their countermeas	tion sure	systems securi s. Students will	ty. Students learn about
Cours	e Outco	omes	una atudan	would be	ablata			
Anter (	Analv	ze various co	vbersecurity f	hreats and	d countermeasures	5		
2.	Explai	n various se	curity techno	logies and	l mechanisms			
3.	Descri	be various e	thical and leg	gal issues r	elated to cybersecu	urity	7	
Detail	led Syll	abus						
Unit	Desc	cription						Duration
1	Introc Basic contro Cyber	Components Components ols, goals of security Fran	s of Cyberse security, Se mework, MIT	ecurity, vu curity Sys TRE ATT&	ulnerabilities, thre stem developmen :CK® Matrix	ats t lif	, Attacks and e cycle, NIST	4
2	2 <b>Design Principles</b> Various security threats and attacks (non-malicious program errors, malwares, APT, social engineering, etc.), threat actors, method of defence, design principles, security policies, types of security policies						4	
3	Cryptography Cryptography basics, transposition and substitution ciphers, stream and block ciphers, cryptographic algorithms (AES and RSA), Diffie-Hellman, key management and distribution, digital signature, hash functions, Attacks on cryptosystems.						5	
4	Identi Authe biome Authe DAC, contro	ity and access entication base etric auther entication, at MAC, and ol models, ide	s manageme sics, Passwor ntication, H tacks on auth Role based entity and acc	nt(IAM) ds, authen Kerberos, nentication Access Co cess provis	atication tokens, ce SSO approach a schemes, Access ontrol, Identify Fe sioning lifecycle.	rtific les, conf eder	cate based and Multi-Factor crol principles, ations, Access	5
5	Secur Firew (Defat Preve	<b>ity Technolo</b> alls, Kinds o alt allow, E ntion System	<b>ogies</b> f Firewalls, F Default Deny ns, types of IL	iltering Se ) on pro: DPS, Virtua	ervices, DMZ, Imp xy, NAT, Intrusic al Private Network	lemo on l x, SS	enting policies Detection and H	5 Aroda
00	tel							REGIST



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6	<b>Risk and Incidents Management</b> Overview of risk management, risk identification and assessment, risk control strategies, selecting risk control strategy, continuity strategies (Business continuity planning, Incident response planning, Disaster Recovery planning)	4
7	<b>Legal and Ethical issues</b> Cybercrimes and criminals, IP, privacy, legal and ethical issues.	3
	Total	30

#### **Text Books**

1. M. Whitman and H. Mattford, Principles of Information Security with MindTap, 6<sup>th</sup> Edition, Cengage, 2018.

#### **Reference Books**

- 1. C. Pfleeger, S. L. Pfleeger and J. Margulies, Security in Computing, 5th Edition, Pearson Education, 2018.
- 2. B. Forouzan, D. Mukhopadhya, Cryptography and Network Security, 4th Edition, McGraw Hill, 2019.
- 3. W. Stallings and L. Brown, *Computer Security: Principles and Practice*, 4<sup>th</sup> Edition, Pearson Education, 2019.

# Laboratory Work

8 to 10 Programming exercises based on the syllabus.

Signature (Head of the Department)

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<b>Program:</b> B Tech/MBA Tech Information Technology					Semester: VII			
Course	e: Software Testir	ıg			Code	:702IT0E035	<b>)</b>	
	Teachin	g Scheme		E	valuati	on Scheme		
Lectu (Hou per weel	rre Practical (Hours k) per week)	Tutorial (Hours per week)	Credit	Internal Contin Assessment (1 (Marks - 50	nuous ICA) D)	Term Examinati (Marks	End ons (TEE) 5- 100)	
2	2	0	3	Marks Scaled	to 50	Marks Sca	aled to 50	
Pre-re	quisite: Software	e engineering	5.					
Course To lea Qualit the de softwa	e Objective Irn traditional test ty and security of velopment life cy are products	sting methoc software pro- cle. It will er	ls applied to oducts rests o nable the stude	develop robust s n early error dete ents implement r	softwar ection a nanual	re products an and reporting and automate	nd services. throughout ed testing of	
Cours	e Outcomes							
After o	completion of the	course, stud	lent would be	able to-				
1.	Design and imp	lement test c	cases for differ	rent levels and ty	pes of t	testing		
2.	Apply test-drive	ite manual ai en developm	nd automatic	testing for difference ve testing and del	iverv i	dules of softw n software dev	are velonment	J
Detail	ed Syllabus	en de velopin		te testing und der	IVCI y II		ciopinent	
Unit	Description						Duration	
1	<b>Introduction to</b> Testing objective Defects, Failures	<b>Software Te</b> es and activi 3.	e <b>sting</b> ties. Tradition	nal and Agile tes	ting pr	ocess. Errors,	4	
2	2       Testing Techniques       6         Black-Box Testing Techniques- Equivalent Partitioning-Boundary Value       6         Analysis (BVA)- State Transition Testing-Decision table based Testing - Cause-       6         Effect Graphing Based Testing - Error Guessing       6         White-Box Testing Techniques- Logic Coverage criteria-Basic path testing-       6         Graph matrices-Loop testing-Data flow testing-Mutation testing       6							
3	<b>Unit Testing &amp;</b> Unit testing fra based Testing T Planning.	Integration ' mework, Na Fechniques.	<b>Testing</b> aming and st Integration	ructuring Test ( test techniques,	Cases, S Data I	Specification- Requirement,	6 Arodo	d
4	<b>System Testing</b> , Test techniques,	<b>, User accept</b> Data Requir	t <b>ance Testing</b> cement, Plann	& Regression To	esting	NU	REGIS SVKM's	TRAR NMIMS
5	Test & Behavior Driven Development Classic Style, Mockist Style Contemporary issues: Applications of Software Testing in industry					ta Road, (West), 00 056.		
	Total						30	
Text B           1.         Pa           20           2.         A           W	B <b>ooks</b> aul C. Jorgensen, 3 )21 lexander Tarlind /esley, 2016.	Software Testi er, Developei	ing: A Craftsm r Testing: Buil	an's Approach, 5 <sup>th</sup> Iding Quality into	Editior Softwa	n, Auerbach Pu are, 1st Editior	ublications,, n, Addison-	



#### **Reference Books**

- 1. Richard Lawrence, Paul Rayner, *Behavior-Driven Development with Cucumber: Better Collaboration for Better Software*, 1<sup>st</sup> Edition, Addison-Wesley, 2019.
- 2. Jez Humble, David Farley, *Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation,* 1<sup>st</sup> Edition, Addison-Wesley, 2010.

## Laboratory Work

8 to 10 Programming exercises based on the syllabus.

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<b>Program:</b> B Tech MBA/Tech Information Technology, B Tech/MBA Tech Computer Engineering					Semester: VII			
Course	o. Ethical II1	- 0-	0					
Cours		Schomo			Evaluati	on Schomo		
Lectu (Hou per weel	reacting rs Practical (Hours k) per week)	Tutorial (Hours per week)	Credit	Internal Co Assessmen (Marks	ntinuous nt (ICA) - 50)	Term End Exa (TEI (Marks-	aminations E) • 100)	
2	2	0	3	Marks Sca	led to 50	Marks Sca	led to 50	
Pre-re	quisite: Compute	er Network,	Operating	Systems and p	programmir	ıg		
Cours This c learn variou	e Objective course is an intro about various m us attacks in the la	duction to v ethods, tool ab environm	vulnerability s and techn ment.	y assessment niques to perfo	and penetra orm ethical	ation testing. St hacking and w	udents will ill simulate	
Cours After o Detail	<ul> <li>Course Outcomes</li> <li>After completion of the course, student would be able to-</li> <li>1. Demonstrate hacking in a lab environment</li> <li>2. Describe various countermeasures</li> <li>3. Describe various professional, ethical and legal issues related to ethical hacking</li> </ul>						ing	
Unit	Description						Duration	
1	1       Introduction       6         Need for adversarial thinking and penetration testing, ethics of hacking, hacking process, types of hackers, types of penetration testing, testing methodologies (OSSTMM, PTES, and OWASP Testing Guide), and Rules of engagement.       6							
2	2 <b>Reconnaissance and scanning</b> Introduction, types of reconnaissance, various techniques of recon (social engineering, web based recon, DNS based recon, network based recon, Google hacking etc.), countermeasures, scanning, types of scanning (port scanning, network scanning, and vulnerability scanning). Spiffers						8	
3	3 <b>Exploitation</b> 10 Password cracking, spoofing, session hijacking, DoS / DDoS, Buffer Overflow, malware, evading firewall and IDS, SQL Injection, OWASP top 10 web application vulnerabilities, hacking wireless networks, metasploit, meterpreter, AV evasion, metasploit databases and tool integration, privilege escalation.						10	
4	Hacking Mobil Overview of and	<b>e platforms</b> droid and iC	DS, OWASP	mobile to 10 1	risks and m	itigation.	2	
5	5 <b>Legal, Professional and Ethical issues</b> Cyber laws in India, various ethical dilemma, professional conduct, and penetration testing report writing						2	
6	Case Study						2	
	Total						30	
Text E	<b>Books</b> R. Pillay, <i>Learn P</i>	Penetration Tes	ting, 1 <sup>st</sup> Editio	on, Packt Public	ation, 2019.		Areso	



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2. M. Walker, CEH Certified Ethical Hacker All-in-One Exam Guide, 4th Edition, McGraw-Hill Education, 2019.

### **Reference Books**

- 1. N. Jaswal, Mastering Metasploit, 4th Edition, Packt Publication, 2020.
- 2. S. Oriyano and M. Solomon, *Hacker Techniques, Tools, and Incident Handling,* 3<sup>rd</sup> Edition, J B Learning, 2020.
- 3. Gilberto Najera-Gutierrez, Juned Ansari, Daniel Teixeira, and Abhinav Singh, *Improving your Penetration Testing Skills*, 1<sup>st</sup> Edition, Packt Publication, 2019.

# Laboratory Work

8 to 10 Programming exercises based on the syllabus.

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<b>Program:</b> B Tech/MBA Tech Information Technology					<b>Semester:</b> VII			]
Course:	Jetwork design	n		Code: 7021T0F036				-
	Teaching	Scheme		Eva	aluatio	n Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Contin Assessment (IC (Marks - 50)	uous CA)	Terr Examinat (Marl	n End tions (TEE) cs- 100)	
2	2	0	3	Marks Scaled t	o 50	Marks S	caled to 50	
Pre-requ	i <b>site:</b> Compute	er Networks						
Course C	bjective	1 · ·	• • • • •	1. 1 .	1	1	1 . 1	-
The cour	se focuses on	designing, s	specification	n, and implement a	a mode	ern, large sc	ale network	
Understa	ang the latest	ficient Oper	nu devices,	, while understand	ing nov	Provisioni	ne network.	
resources	can be learnt	ilcient Open	auons, Au		gemen	, 11001510111	ng, network	
Course C	utcomes							
After con	poletion of the	course. stud	ent would l	pe able to-				
1. Expl	ain the major a	pplication a	rchitectures	and applicable star	ndards	of networks	5	
2. Desi	gn and manage	e computer 1	network sys	tems				
3. Dem	onstrate the lo	gical design	process for	core, distribution, a	and acc	ess network	S	
4. Desc	ribe how netw	ork monitor	ing and ala	rm reporting influe	nces th	e network d	esign	<b>J</b>
Deteiled	Carllabara							
Unit	Description						Duration	
							2	-
	troduction	ochnical go	le of potur	ork coalability av	ailabilii	n notwork	3	
	rformance def	finitions ma	lis of fielwo	rk design tradeoffs	charac	torizing the		
n n	twork traffic	understandi	ng various s	atandards	charac	terizing the		
				1				
2 C	haracterizing t	he Existing	Internetwo	rk na naturark man la	rao int	arratuarla	6	
	gical architect		k addressi	ng and naming a	nəlyzir	a network		
10	ailability and	network ut	lization ne	itwork accuracy a	nalyzin	g errors on		
SI	vitched Ethern	net networks	analyzing	network efficiency	v analy	yzing delay		
at	nd response tin	ne	, analyzing	network enterency	, analy	Zing aciay		
C	haracterizing [	Network Tra	offic					
T	erminal/host t	raffic flow, c	lient/servei	traffic flow, peer-t	o-peer	traffic flow,		
se	rver/server tr	affic flow, d	istributed c	omputing traffic fl	ow, tra	ffic flow in		
v	oice over IP ne	etworks, cha	racterizing	traffic load, charact	terizing	g Quality of		
Se	ervice requiren	nents.	0		C			
3 L	ogical Networl	k Design					6	
	esigning a net	work topolog	gy, hierarch	ical network desigr	n, flat W	VAN		
T	pologies, flat	LAN topolog	gies, redund	lant network desig	n topol	ogies,		0
S	panning tree pi	rotocol, virtu	al LANs, w	ireless LANs, redu	ndant v	wireless	000	
ac	cess points, de	esigning the	enterprise e	dge topology, secu	re netw	ork design	Mago	
to	pologies.		_			č		
4 D	esigning Mod	els for Addr	essing and	Numbering			REGIS	TRAR
	0 0		0	- O		N	SVKM's	NMIMS
						AN AN	V L Meht	a Road,
(nate)						( CO ( MUMBAL-56.)	Mumbri	(West),
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	Network layer addresses, IP dynamic addressing, IP version 6, zero configuration networking, hierarchical routing, route summarization (aggregation), discontiguous subnets, mobile hosts, link-local addresses, global unicast addresses					
5	Selecting Switching and Routing Protocols Portfast, uplinkfast and Backbonefast, Unidirectional link detection, dynamic trunk protocol, distance-vector routing protocols, hierarchical versus Non- hierarchical routing protocols, IP routing, border gateway protocol, integrated routing and bridging.	4				
6	<b>Testing, and Optimizing the Network Design</b> Testing your network design, optimizing your network design.	2				
7	<b>Developing Network Security Strategies</b> Network security design, security mechanisms, modularizing security design, securing wireless networks, authentication in wireless networks.	3				
	Total	30				
Tex	tbooks					
	<ol> <li>Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw-Hill Education, 2017.</li> <li>Michael Thomastic, Network Design Cookheely, Architecting Ciaco Networks, Version 10.2.9, 14th</li> </ol>					
	Edition, Cisco press, August 2016.	11 10.2.07 1				
Ref	Reference Books					
1.	1. Russ White, Denise Donohue, Art of Network Architecture, The: Business-Driven Design					
	( <i>Networking Technology</i> ) Cisco press, 1 <sup>st</sup> Edition, 2014.					
2.	Priscilla Oppenheimer, Top-Down Network Design, 3rd Edition, Cisco Press, 2011.					
Lab	oratory Work					
8 to	10 Programming exercises based on the syllabus.					

Signature (Head of the Department)

Arosal

REGISTRAR SVKM's NMIMS V L Mehta Road, Vile Parle (West), Mumbai-400 056.



Program: B Tech / MBA Tech (Computer Engineering,					Semester: VI / VII / V		
Inform	ation Technolo	ogy, Artific	cial Intelli	igence)			
Course	: Distributed C	Computing	r 2		Code:70	)2CO0C034	1
	Teaching	g Scheme	1		Evalua	tion Schen	ne
Lectur (Hour per week	e Practical s (Hours per ) week)	Tutorial (Hours per week)	Credit	Internal Conti Assessment ( (Marks - 5	nuous (ICA) 60)	Terr Examinat (Mark	m End tions (TEE) <s -="" 100)<="" th=""></s>
2	2	0	3	Marks Scaled	to 50	Marks So	caled to 50
Prereq	u <b>isite:</b> Operati	ng System	S				
Course	Objective						
To inf	roduce the co	ncepts and	d design	of distributed c	omputin	g and algo	orithms that
suppo	rt distributed	computing	5.				
Course	Outcomes						
After c	ompletion of th	he course,	student v	vill be able to -			
1. E	xplain the bas	ic concepts	s of distri	buted computing	g		
2. A	apply the conc	epts of dis	tributed o	computing to im	plement	various me	echanisms
C	f communicati	ion		1 0	L		
3. A	nalyze variou	s approach	nes of syr	nchronization, m	utual exc	clusion, elec	ction
a	lgorithms and	fault toler	ant servi	ces		,	
4. F	lecognize diffe	rent kinds	of namir	ng and their impl	lementat	ion	
Detai	ed Syllabus			0 1			
Unit	Descriptio	n					Duration
1	Introducti	on to Dist	ributed S	System			05
	Definition,	Goals, E	Examples	of Distributed	System	Internet.	
	System at	rchitecture	es-central	ized architectur	e, dece	ntralized	
	architectur	e, hybrid a	architectu	are, Client-Serve	r Model,	Servers-	
	general de	sign issues	s, server c	clusters, managir	ng server	clusters.	
2	Communic	ation					06
	Basic RPC	operation,	RPC in	plementation, R	RPC sem	antics in	
	presence of	failures, l	RMI- Bas	sics, Implementa	tion, Cas	se study-	
	Java RMI,	Message	oriented	communicatior	n-: trans	ient and	
	persistent c	ommunica	tion.				

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SVKM's NMIMS University

	Mukesh Patel School of Technology Management and Engineerin	lg
	Stream oriented communication- support for continuous media,	
	streams and QoS, stream synchronization.	
3	Synchronization	06
	Introduction, Physical Clock synchronization algorithms,	
	Logical clocks, event ordering, implementation of Logical	
	clocks, Lamport's logical clock algorithm, Vector clocks, Mutual	
	exclusion: Centralized, distributed and token ring mutual	
	exclusion algorithms, comparison of these algorithms.	
	Traditional election algorithm- Bully and Ring election	
	algorithm.	
4	Fault Tolerance	08
	Introduction, Process resilience, Reliable group communication.	
5	Naming	05
	Names, identifiers, and addresses, Flat naming , Structured	
	naming: name spaces and resolution, implementation of name	
	space, Case study- Domain Name System, Attributed based	
	naming- Directory services.	
	Total	30
Text B	ooks	
1. A F	Andrew S. Tanenbaum, <i>Distributed System: Principles and Paradigms</i> , 3 <sup>1</sup> Pearson Prentice Hall, 2017.	<sup>d</sup> Edition,
Refere	nce Books	
1. G E	eorge Couloris, <i>Distributed System: Concept and Design</i> , 5 <sup>th</sup> edition, Peaducation, 2009.	arson
2. Pi	radeep K. Sinha, <i>Distributed Operating System</i> , IEEE Press, Prentice Ha	ll of India
3. M	lei-Ling L. Liu, Distributed Computing: Principles and Applications. Add	ison –
W	Vesley, 2004.	
Labora	atory / Tutorial work:	
8 to 10	experiments (and a practicum where applicable) based on the syllab	us.

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AY 2023-24

#### SVKM's NMIMS Mukesh Patel School of Technology Management & Engineering

Program: B	Tech (Artific	ial Intelligenc	e, Compu	ter Semester: V/	'VII	
Engineering	g, Information	n Technology,	Electron	ics &		
Telecommu	inication Eng	ineering, AI a	nd ML)			
MBA Tech	(Artificial Inte	elligence, Con	nputer En	gineering,		
Information	n Technology)	)				
Course: De	ep Learning			<b>Code:</b> 702AI0	)C008	
	Teaching	Scheme		Evaluation Se	cheme	
Lecture	Practical	Tutorial		Internal Continuous	Term End	
(Hours per	(Hours	(Hours per	Credit	Assessment (ICA) Ex	kaminations (	TEE)
week)	per week)	week)		(Marks 50)	(Marks 100	1)
	1 <i>,</i>	,				<u> </u>
2	2	0	3	Marks Scaled to 50 N	/larks Scaled to	o 50
Prerequisit	e: Machine Le	earning, Statis	stical Met	hods		
Course Ob	iective					
This course	, focuses on th	e fundamenta	als of neur	al networks along with a pra	actical perspec	tive of
advanced t	opics such as	s convolution	al neural	networks, recurrent neural	networks, and	d long
short-term	memory with	their real-wo	rld applic	rations.	,	0
Course Out	tcomes					
After comp	letion of the c	ourse, studen	ts will be	able to -		
1. Exp	lain the funda	amentals of de	eep learni	ng.		
2  Ann	ly optimizatio	on and regular	rization fo	r tuning the parameters of de	en neural net	works
2. Fipp	d convolution	al neural net	works arc	hitectures for various applica	ations	
4 App	ly rocurront n	oural notwork	ke archito	ctures for various application	26	
Detailed S	allabus	iculai lictwoll	xs arctific		15.	
Unit F	Description				Dur	ation
1 In	troduction to	Deen Learni	nσ			<u>ution</u> 12
	hat is deep le	Parning motiv	vation for	using deep learning Appli	cations	)2
of	deen learnin	$\sigma$ in various d	omains	using ucep learning, rippin		
$\frac{01}{2}$	eural Networ	<u>ke</u>	omunis.		(	18
	sics of N	eural netwo	rk Per	centron Multilaver perce	entron	<i>J</i> 0
Fe	edforward n	eural networ	rk back-r	propagation Activation fun	ctions	
	oss functions	Gradient des	cent for n	eural networks	ctions,	
3 0	ntimization a	nd Regulariz	ation for	Deen Learning	(	)5
	ochastic GD	Mini Batch	SGD	Momentum Based GD Ne	esterov	10
A	celerated GI	) AdaGrad I	RMSProp	Adam 11 and 12 Regulari	zation	
F=	rlv stopping	drop out		Trading Di una DZ Regulari		
4 C	nvolutional	Neural Netw	orks		(	18
	nvolution o		UIN5		aluma	
	Jivoianon 0	neration no	olino str	iding convolution over w	on me. I	
na	rameters of	CNN Full	oling, str	iding, convolution over ve ted networks v/s CNN	Deen	
pa	arameters of	CNN, Full	oling, str y connec	iding, convolution over vo cted networks v/s CNN,	Deep	- 0



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#### SVKM's NMIMS Mukesh Patel School of Technology Management & Engineering

	convolutional architectures: AlexNet, Inception Network, ResNet.					
	Transfer learning using CNN, Applications of CNN.					
5	Recurrent Neural Networks	07				
	Vanilla RNN, Back-propagation through time, Vanishing and Exploding					
	gradients, Long Short-Term Memory (LSTM), Gated Recurrent Unit					
	(GRU), Applications of RNN.					
	Total	30				

## **Text Books**

- 1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, *Deep Learning*, 1<sup>st</sup> Edition, MIT Press Book, 2017
- 2. Charu Agarwal, *Neural Networks and Deep Learning: A Textbook*, 1<sup>st</sup> Edition, Springer, 2018 **Reference Books** 
  - 1. François Chollet, Deep Learning with Python, 1st Edition, Manning Publication, 2017
  - 2. Aurelien Geron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow,* 2<sup>nd</sup> Edition, O'Reilly, 2019.

## Laboratory/ Tutorial Work

8 to 10 experiments (and a practicum where applicable) / based on the syllabus

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