Hazratbal, Srinagar, Kashmir, 190006 India.



COURSES & SYLLABI (Batch 2019 onwards)

Computer Science & Engineering Department

Department of Computer Science & Engineering National Institute of Technology Srinagar.

Introduction

The Department of Computer Science & Engineering started functioning from 2007. It offers four year B.Tech degree course in Computer Science & Engineering. The initial intake in 2007 was 40 and has now increased to 60. The degree is awarded after completion of a minimum of 200 credits. Common courses for 50 credits are offered to students of all branches in a common first year spread over 2 semesters. Courses for the remaining 150 credits are offered to students during a span of three years spread over 6 semesters.

The first Board of Studies (BoS) meeting of the B.Tech Computer Science & Engineering Course was held in May 2008. In the meeting courses to be taught at 3rd and 4th Semester level were only approved. The second Board of Studies (BoS) was held on November 2009. The third BOS was held on 16-06-2014 and fourth BOS on 06-03-2015. In this meeting, course scheme of B.Tech Computer Science & Engineering degree course from 3rd to 8th Semesters was prepared, examined, revised, formulated and approved for batch starting from 2014. The scheme of courses has been designed such that at least 50% of the courses are offered by Department of Computer Science & Engineering. The remaining 50% courses are interdisciplinary and are offered by Departments of Information Technology, Department of Electronics & Communication Engineering, Electrical Engineering, Mathematics and Humanities Departments.

Other main features of the scheme are:-

- 1. Courses offered are 2 credits, 3 credits or 4 credits.
- 2. One hour lecture/tutorial has been assigned 1 credit weightage.
- 3. Two hour laboratory per week has also been assigned 1 credit weightage.
- 4. A continuous evaluation scheme is used to evaluate the students for each course. The evaluation is as under:

Midterm	30 marks
Class Assessment	10 marks
Major Exam	60 marks.
	4 6 11 1

5. Grades are allotted to the students as per the following scheme:

Marks	Grades	Points
0 to 39	F	4
40 to 50	С	5
51 to 60	\mathbf{C}^+	6
61 to 70	В	7
71 to 80	\mathbf{B}^+	8
81 to 90	А	9
91 to 100	A^+	10

6. At the end of each semester a cumulative grade point average (CGPA) is calculated for the courses taken by a student.

Hazratbal, Srinagar, Kashmir, 190006 India.

Computer Science & Engineering Department

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Department of Computer Science & Engineering National Institute of Technology Srinagar

Course Structure for B.Tech. Computer Science & Engineering

(Batch 2019 onwards)

Semester: 3rd

S.No.	Subject	Code	LTP	Credits
1	Object Oriented Programming	CST201	3 1 0	4
2	Object Oriented Programming -Lab	CSL202	0 0 2	1
3	Internet & Web Technologies		0 0 4	2
4	Signals & Systems		3 1 0	4
5	Basic Electronics		3 1 0	4
6	Basic Electronics Lab		0 0 2	1
7	Database Management Systems	CST203	3 1 0	4
8	Database Management Systems - Lab	CSL204	0 0 2	1
9	Discrete Mathematics		3 1 0	4
	Total Credits			25

Semester: 3rd - Other Department Courses - Information Technology

S.No.	Subject	Code	LTP	Credits
1	Object Oriented Programming	CST201	3 1 0	4
2	Object Oriented Programming -Lab	CSL202	0 0 2	1

Semester: 4th

S.No.	Subject	Code	LTP	Credits
1	Data Structures	CST250	3 1 0	4
2	Data Structures – Lab	CSL251	0 0 2	1
3	Introduction to Probability Theory &		3 0 0	3
	Statistics			
4	Digital Electronics & Logic Design		3 1 0	4
5	Digital Electronics & Logic Design – Lab		0 0 2	1
6	Software Engineering		3 1 0	4
7	Communication Systems		3 1 0	4
8	Communication Systems – Lab		0 0 2	1
9	Control Systems		3 0 0	3
	Total Credits			25

Semester: 4th - Other Department Courses - Information Technology

1 Data Structures CST250 3 1 0	
	4
2 Data Structures – Lab CSL251 0 0 2	1

Semester: 5th

S.No.	Subject	Code	L	Т	Р	Credits
1	Computer Organization & Architecture	CST305	3	1	0	4
2	Design & Analysis of Algorithms	CST306	3	1	0	4
3	Microprocessor	CST307	3	0	0	3
4	Microprocessor - Lab	CSL308	0	0	2	1
5	Operating Systems	CST309	3	1	0	4
6	Python Programming	CST310	3	1	0	4
7	Python Programming - Lab	CSL311	0	0	2	1
8	Data Communication	CST312	3	1	0	4
	Total Credits					25

Semester: 5th - Other Department Courses

- Electronics & Communication Engineering

S.No.	Subject	Code	LTP	Credits
1	Data Structures	CST313	3 1 0	4
2	Data Structures Lab	CSL314	0 0 2	1

- Information Technology

S.No.	Subject	Code	L	Т	Р	Credits
1	Design & Analysis of Algorithms	CST306	3	1	0	4

Semester: 6th

S.No.	Subject	Code	L	Т	Р	Credits
1	Artificial Intelligence	CST352	3	1	0	4
2	Artificial Intelligence - Lab	CSL353	0	0	2	1
3	Computer Networks	CST354	3	1	0	4
4	Computer Networks - Lab	CSL355	0	0	2	1
5	Theory of Computation	CST356	3	1	0	4
6	Computer Graphics	CST357	3	1	0	4
7	Computer Graphics -Lab	CSL358	0	0	2	1
8	Java Programming	CST359	2	0	2	3
9	Elective I	CSE0XX	3	0	0	3
	Total Credits					25

Semester: 7th

S.No.	Subject	Code	L	Т	Р	Credits
1	Compiler Design	CST415	3	0	0	3
2	Compiler Design - Lab	CSL416	0	0	2	1
3	Network Security	CST417	3	1	0	4
4	Network Security - Lab	CSL418	0	0	2	1
5	Pre-Project	CSP419	0	0	6	3
6	Seminar	CSS420	0	0	2	1
7	Elective II	CST0XX	3	0	0	3

8	Elective III	CST0XX	3	0	0	3
9	Swayam Online Course		3	0	0	3
10	Operations Research & Optimization		3	0	0	3
	Total Credits					25

Semester: 7th - Other Department Courses

- Electronics & Communication Engineering (M.Tech.)

S.No.	Subject	Code	L	Т	Р	Credits
1	Internet & Web Design	CSL501	1	0	2	2
2	RDBMS	CST502	2	0	2	3

- Information Technology (Elective)

S.No.	Subject	Code	LTP	Credits
1	Compiler Design	CST415	3 0 0	3
2	Compiler Design - Lab	CSL416	0 0 2	1

Semester: 8th

S.No.	Subject	Code	L	Т	Р	Credits
1	Project	CSP460	0	0	12	12
2	Elective IV	CST0XX	3	0	0	3
3	Elective V	CST0XX	3	0	0	3
4	Swayam Online Course		3	0	0	3
5	Practical Training & Tour	CSI461		-		1
6	Industrial Organization & Management		3	0	0	3
	Total Credits					25

List of Electives

S.No.	Subject	Code
1.	Simulation & Modeling	CST001
2.	Graph Theory	CST002
3.	Digital Signal Processing	CST003
4.	Multimedia Technology	CST004
5.	Logic Programming	CST005
6.	Embedded Systems	CST006
7.	Advanced Java & Android Programming	CST007
8.	System on Chip (SoC)	CST008
9.	Advanced Internet Technologies	CST009
10.	Wireless Communication	CST010
11.	Fault Tolerant Computing	CST011
12.	Image Processing	CST012
13.	System Design using HDL	CST013
14.	Real Time Systems	CST014
15.	Unix & Shell Programming	CST015
16.	High Speed Networks	CST016
17.	Advanced Algorithms	CST017
18.	Reconfigurable Computing	CST018
19.	Computer Vision	CST019
20.	Advanced Computer Networks	CST020
21.	Advanced Computer Graphics	CST021
22.	Advanced DBMS	CST022
23.	Advanced Computer Architecture	CST023
24.	Advanced Compilation Techniques	CST024
25.	Principles of Cryptography	CST025
26.	Neural Networks	CST026
27.	Pervasive Computing	CST027
28.	Distributed and Parallel Computing	CST028
29.	Cloud Computing	CST029
30.	Software Project Management	CST030
31.	Big Data	CST031
32.	Cyber laws and Forensics	CST032
33.	Expert Systems	CST033
34.	Mobile Computing	CST034
35.	Green Computing	CST035
36.	Introduction to Robotics	CST036
37.	Data Analytics	CST037
38.	Computational Biology	CST038
39.	Special topics in Computer Science	CST039
40.	System & Network Administration	CST040
41.	Pattern Recognition	CST041
42.	Natural Language Processing	CST042
43.	Quantum Computing	CST043
44.	Deep Learning	CST044
45	Introduction to Data Science	CST045

46.	Internet of Things (IoT)	CST046
47.	Advanced Cryptography	CST047
48.	Data Mining	CST048
49.	Advanced Graph Algorithms	CST049
50.	Advanced Java	CST050
51.	Numerical Methods	Maths

List of Swayam Online Courses

S.No	Course Name	Course Duration
1.	Animations	15 weeks
2.	Animations	15 weeks
3.	Applied Natural Language Processing	12 weeks
4.	Art of C Programming	12 weeks
5.	Artificial Intelligence	12 weeks
6.	Artificial Intelligence Search Methods for Problem Solving	12 weeks
7.	Bandit Algorithm	12 weeks
8.	Computer Fundamentals	12 weeks
9.	Computational Number Theory and Algebra	12 weeks
10.	Computer Networks	12 weeks
11.	Computer Architecture & Organization	12 weeks
12.	Cyber Security	12 weeks
13.	Cyber Security	12 weeks
14.	Concrete Technology	12 weeks
15.	Data Mining	12 weeks
16.	Data Structure and Algorithm in Java	12 weeks
17.	Deep Learning	12 weeks
18.	Deep Learning in Computer Vision	12 weeks
19.	Design and Analysis of Algorithms	12 weeks
20.	Discrete Math	12 weeks
21.	Ecommerce Technologies	12 weeks
22.	Electricity and Safety Measures	12 weeks
23.	Energy Resources and Conversion Processes	14 weeks
24.	Fundamentals of computer systems	12 weeks
25.	Introduction to IT	12 weeks
26.	Web based Technologies & multimedia	12 weeks
27.	Linux Bash	12 weeks
28.	Linux Operating System	12 weeks
29.	Linux for Sys-Ads	12 weeks

Hazratbal, Srinagar, Kashmir, 190006 India.



3rd Semester

Computer Science & Engineering

	-	Computer Science & Engin itute of Technology Srinag	0	
Course Titl			3^{rd}	
Departmen	Ŭ		-)1
Credits	04	L	T	Р
Course Typ		3	1	0
<u></u> Jr		Course Objectives		
mair struc • Dem toda • Und	focus on C++ by getting t tures. onstrate the function, class v live examples in C++ Co	delete instances of classe	tokens and i	ts other contro
 Dem Lang code Und 	onstrate and Implement uages along with the poin in C++. erstand and implement ge	the main features of Objecter concept in relation with eneric classes, functions, fill-for developing software pro-	real world on the standard s	examples usin
	=	rse Outline / Content		
Unit	Cour	Topics		Week
Pa Pr A Ta K de O	radigm, Procedural progra ogramming, object oriente oplications of OOPs. Defined, Expressions an eywords, Identifiers & C fined Data types, Derived	ented thinking: Need for imming vs Object Oriented ed concepts. Benefits, Langu d Control Structures: Constants, Basic Data type I Data Types, Memory Mar Expressions, Operator Ove	Tokens, es, User- nagement	3
re ov C fu al re	Ference, inline function erloading. asses and Objects: Spectrations, private memberfut ocation for objects, arrays solution operator, objects	nction, function prototyping ns, default functions, ecifying a class, defining nctions,array within a class, s of objects,Access Specifie s as function arguments, , local classes, Friend Funct	function member memory rs, scope returning	3
	onstructors & Destructor nstructors:default,paramet pyconstructor,constructor fault parameter, dynamic i	overloading, constructed	and or with	3

	Strings: Creating and manipulating string objects, accessing characters in strings, comparing and swapping.	
4.	 Operator Overloading & Type Conversion: Definition & Rules of overloading Operators, Overloading Binary & Unary Operators.Data Conversion: Basic to User Defined, User defined to basic, Conversion from one user-defined to other. Inheritance: Definition, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual base classes, abstract classes. Pointers, Virtual Functions and Polymorphism: Pointers, Pointers to Objects and derived classes, early vs. late bindingvirtual functions, pure virtual functions. 	3
5.	 Templates: Class templates, function templates, overloading of function templates, member function templates. Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, Container Classes, General Theory of Operation, Vectors. Exception Handling: Exceptions, handling various types of Exceptions(<i>Try, Catch, throw</i>) including any universal exception. File and Stream Handling:Classes for file stream operations, opening and closing files, File opening modes, file Pointers, Error handling during file operations, File I/O with Member Functions, Overloading the Extraction and Insertion Operators, memory as a Stream Objectcommand line arguments. 	3
	Text Books	
1.	Robert Lafore, "Object Oriented Programming in Turbo Publications,	-
2.	Balagurusamy, "Object Oriented programming with C++", Tata M	cGraw Hill.
	References	
1.	BjarneStrustrup, "The C++ programming Language", Addison We	
2.	Booch, "Object Oriented Analysis and Design with Applications, A	
3.	Chair H. Pappas & William H. Murray, "The Complete Referen TMH.	ice Visual C++",

	Department of Compute	6	0	
<u> </u>	National Institute of		3^{rd}	
Course Ti	tle Object Oriented Programmin lab	g Semester	3	
Departme		Course Code	CST202	
Departine	Engineering	Course Coue	051202	
Credits	01	L	Т	Р
Course Ty	r pe Lab	0	0	2
	Course (Objectives		
	e student should be able to exp	lain the fundamenta	al properties	of the C+-
	guage.			
	e student should be able to com	ibine the elements	of the C++	language 11
	reloping structured programs. e student should be able to demons	strate the skills neces	ssary to corre	ctly compile
	bug, and test programs in C++.	strate the skins need	ssary to corre	eny complic
		Outcomes		
At the end	of the course student will be able to			
• Ap	ply C++ features to program design	and implementation		
• Exp	plain object-oriented concepts and d	escribe how they are	supported by	C++
	e C++ to demonstrate practical expe	1 0	0	
	alyse a problem description and de	esign and build obje	ct-oriented so	oftware using
0	od coding practices and techniques			
	e common software patterns in		sign and rec	cognise thei
app	licability to other software develop	Synopsis		
The object	ive of the lab course to familiarise s		ncepts.	
J		line / Content	1	
Unit	Topics			Week
Lab #1, #2	Simple programs in C++ using inb	uilt input/output func	tions.	2
Lab #2	Function overloading, default argu	iments in C++.		1
Lab #3	Simple class design in C++, names	spaces, objects creati	ons.	1
Lab #4	Class design in C++ using dynamic	e memory allocation.		1
Lab #5	Constructor, Destructor, copy cons	tructors.		2
Lab #6	Operator overloading, friend functi	ons.		1
Lab #7	Overloading assignment operator, t	type conversions.		2
	Inheritance, run-time polymorphism	n.		1
Lab#8	Template design in C++.			1
	1 0			
Lab#8 Lab #9 Lab #10	Interfaces and Inheritance.			1
Lab #9 Lab #10				1 1
Lab #9 Lab #10 Lab #11	Interfaces and Inheritance. File and Exception handling. Text	Books		1
Lab #9 Lab #10 Lab #11 1. H	Interfaces and Inheritance. File and Exception handling.		Turbo C++	1

	References					
1.	BjarneStrustrup, "The C++ programming Language", Addison Wesley,					
2.	Booch, "Object Oriented Analysis and Design with Applications, Addison Wesley.					
3.	Chair H. Pappas & William H. Murray, "The Complete Reference Visual C++",					
	TMH.					

Department of Computer Science & Engineering National Institute of Technology Srinagar						
Course Title	Database Management Systems	s Semester 3 rd				
Department	CSE	Course Code	e CST203			
Credits	04	L	Т	Р		
Course Type	Theory	3	1	0		
	Course Object	timog				

Course Objectives

- Learn and practice data modelling using the entity-relationship and developing database designs.
- Apply normalization techniques to normalize the database
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.
- Learn about the basics data recovery techniques.

Learning Outcomes

Upon successful completion of the course, the student will be able to:

- Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- Define the terminology, features, classifications, and characteristics embodied in database systems.
- Demonstrate an understanding of the relational data model.
- Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
- Formulate, using relational algebra, solutions to a broad range of query problems.
- Formulate, using SQL, solutions to a broad range of query and data update problems.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
- Understand the different query processing and transaction management techniques.
- Recover a database from a possible failure.

Course Synopsis

Introduction to DBMS- Historical perspective, File Versus a DBMS, Advantages of DBMS. ER model, Relational Algebra, Relational Calculus and SQL- Queries. ACID properties, transactions, schedules and concurrent executionof transactions. Overviewof Query Evaluation, operator evaluation, Database Recovery, Failure classification, Recovery and atomicity.

	Course Outline / Content	
Unit	Topics	Week
1.	Basic Concepts and Conceptual Database Design: Database	3
	Users, Characteristics of the Database, Database Systems, Data	
	Models, DBMS Architecture & Data Independence, Database	
	Languages & Interfaces. Overview of Hierarchical, Network &	
	Relational Data Base Management Systems. Data Modelling	
	Using the Entity-Relationship Model – Entities, Attributes and	
	Relationships, Cardinality of Relationships, Strong and Weak	

	Entity Sets, Generalization, Specialization, and Aggregation,	
	Translating your ER Model into Relational Model.Integrity	
-	constraints overrelations	
2.	Relational Data Base Design and Oracle Architecture: Functional Dependencies & Normalization for Relational Databases, Functional Dependencies, Normal Forms, Lossless Join & Dependency, Preserving Decomposition, Database Storage, Oracle Software Structures, Shared Database Access Mechanism, Database Protection. Case Study – ORACLE.	3
3.	Relational Model, Languages & Systems: Relational Data Model, Relational Model Concepts, Relational Model Constraints, Relational Algebra, SQL – A Relational Database Language, Data Definition & Manipulation in SQL, View and Queries in SQL, Specifying Constraints and Indexes in SQL, Practicing SQL commands using ORACLE. Case Study – ORACLE. Query Processing: Overviewof Query Evaluation, operator evaluation, Algorithms for relational operations- Selection operation, General selection condition, Projection operation, Join operation, set operation andaggregate operation, Evaluation of relational operations.	3
4.	Transaction Management: ACID properties, transactions, schedules and concurrent executionof transactions, Concurrency control- lock based protocol, Serializability, recoverability, dealing with deadlocks and Concurrency control without locking.	3
5.	Database Recovery: Failure classification, Recovery and atomicity, Log-based recoveryshadow paging and Advanced Recovery Techniques. Security and Authorization-Accesscontrol, Direct access control and Mandatory access control, Role of DBA.	2
	Text Books	
1.	Database system Concept by Silberschatz and Korth 6th Edition	
2.	Elamsri, Navathe, Somayajulu and Gupta, "Fundamentals of Dat Pearson Education	abase Systems",
3.	Database Systems, Thomas Connolly, Carolyn Begg, Pearson 4th	edition
	References	
1.	Raghu Ramakrishnan, Johannes Gehrke, "Database Managemen McGraw Hill.	t Systems", Tata

		National Institute of Tech	nology Srinagar		
Course 7	ſitle	Database Management Systems Lab	Semester	3 rd	
Departn	nent	Computer Science & Engineering	Course Code	CST	204
Credits		01	L	Т	Р
Course 7	Гуре	Lab	0	0	2
		Course Object	tives		
To imple	ment th	ne different concepts learned in the	theory class of l	OBMS	using embedded
SQL and		-	•		C
		Learning Outc	omes		
• D	esign a	nd Implement a database schema			
• D	evise q	ueries using DDL, DML, DCL and	I TCL commands		
	-	application programs using PL/SQ			
• D	esign a	nd implement a project using embe	edded SQL and G	UI.	
• A	.pply m	odified components for performance	ce tuning in open	source	software.
		Course Synop			
Familiari	zation	of Oracle RDBMS, SQL*Plus, SQI		e, Exce	ption Handling
Compilat	tion and	l Run-time, user-defined, Stored pro	ocedures.		
		Course Outline /	Content		
Unit		Topics			Week
	1)	Introduction to SQL, RDBMS.			1
Lab #1	•	Visualizing the architecture of RDB			
	•	Different data types and its implement	ntation.		
	1)				1
	1)	SQL commands: Implementation of Creating and man	aging SOL tables		1
Lab #2		DDL(Data definition language): Im		reate	
	•	Alter, drop, rename, truncate, comme	L	reate,	
		· ·····, ····p, ·······, ······, ······, ······			
	1)	Basic Parts of speech in SQL			1
	•	Implementation of Relational operator			
Lab #3	•	Implementation of Logical operator		ANY,	
		BETWEEN, EXISTS, IN, LIKE, NO			
	•	SQL functions: (SUM, MAX, AVE	RAGE, LIKE)		1
		Changing of Data in tables). II-deseter 1'	~ 1L-	1
	•	DML(Data manipulation Language implementation of Select, Insert, Upo		U	
Lab #4	2)	Retrival of data from the table			
	•	Understanding implementation of s	imple aueries on	single	
		table only.	T Jurios on		
	1)	Implementation of constraints: N	ot null, Primary	Key,	1
		Unique, Check, Foreign key)	-	-	
	2)	Combining Tables and execution of a	•		
T - 1 - <i>11 -</i>		• Perform Join, inner join, ou	iterjoin, natural jo	in and	
		subtypes of each.Implementation of Advance			
Lab #5		 Implementation of Advance 	a queries, subque	v and	
Lad #5		grouping (Group by and have		5	

Lab #6	 Understanding the dependence in queries, correlated queries using Existential quantifiers Understanding difference in replacing IN with OUTER JOIN, EXISTS and NOT EXISTS. 	1
Lab #7	 Implementation of Security by assigning Privileges to database users DCL: (Data control Language) Understanding the implementation of Grant, Revoke and views. TCL: (Transaction control Language): Understanding the implementation of Begin, Commit, Rollback and Save point in transaction 	1
Lab#8	1) Lab Project: Students are required to submit a case study	1
	Text Books	
1.	James, Paul and Weinberg, Andy Oppel, "SQL: The Complete McGraw Hill.	Reference", Tata
2.	Michael McLaughlin, "Oracle Database 11g PL/SQL Progra press.	mming", Oracle

Hazratbal, Srinagar, Kashmir, 190006 India.



4th Semester

Computer Science & Engineering

		Department of Comput	ter Science & Enginee f Technology Srinagar	0	
Course 7	Fitle	Data Structures	Semester	4 th	
Departn		Computer Science &	Course Code	CST25	0
		Engineering			
Credits		04	L	Т	Р
Course 7	Гуре	Theory	3	1	0
		Course	Objectives		
• U	Inderst	and the concept of ADTs(Abs	tract Data Types)		
• I	dentify	data structures suitable to sol	lve problems		
• [Develop	p and analyze algorithms for s	tacks, queues along with	h their app	olications
• [Develop	p algorithms for binary trees a	nd graphs along with th	eir applica	ations
• Ir	npleme	ent sorting and searching algor	rithms		
• Ir	npleme	ent symbol table using hashing	g techniques		
		· · · · · · · · · · · · · · · · · · ·	g Outcomes		
2		e course, the students will be			
	-	and analyze programming prol		1 .	1 . 1 . 0
		appropriate data structures and	d algorithms and use it t	to design a	lgorithms for
	-	c problem. and the necessary mathematics	al abstraction to solve n	roblems	
• 0	nuersu		e Synopsis		
The cour	se seel	ts to empower students with a		concepts	to enable then
		ient programmers.		1	
		1 0	tline / Content		
	e effic	Course Out Topic	S		Week
to becom	ne effic Intro	Course Out Topic duction: Basic concept of dat	s a, structures and pointer	^S.	
to becom Unit	ne effic Intro String	Course Out Topic duction: Basic concept of data gs: Representation, String	S	^S.	Week
to becom Unit	ne effic Intro String	Course Out Topic duction: Basic concept of dat	s a, structures and pointer	^S.	Week
to becom Unit 1.	ne effic Intro String String	Course Out Topic duction: Basic concept of data gs: Representation, String g.h library functions.	s a, structures and pointer operations, Implem	rs. ienting	Week 1
to becom Unit	Intro String Arra	Course Out Topic duction: Basic concept of data gs: Representation, String g.h library functions. ys: Representation, im	s a, structures and pointer operations, Implem	^S.	Week
to becom Unit 1.	Intro String String Array repres	Course Out Topic duction: Basic concept of data gs: Representation, String g.h library functions.	s a, structures and pointer operations, Implem plementation, polyn	rs. ienting	Week 1
Unit 1. 2.	Intro String String Array repres	Course Out Topic duction: Basic concept of data gs: Representation, String g.h library functions. ys: Representation, im sentation. Limitations.	s a, structures and pointer operations, Implem plementation, polyn	rs. ienting	Week 1 1
to becom Unit 1. 2.	Intro String String Array repres Linea	Course Out Topics duction: Basic concept of data gs: Representation, String g.h library functions. ys: Representation, im sentation. Limitations. or Data Structures: Linked I d List and its comparison with	s a, structures and pointer operations, Implem plementation, polyn Lists h array implementation.	rs. nomial Types	Week 1 1
to becom Unit 1. 2.	Intro String String Array repres Linea Linke of Li	Course Out Topic duction: Basic concept of data gs: Representation, String g.h library functions. ys: Representation, immediation. Limitations. or Data Structures: Linked I d List and its comparison with nked lists, Applications of	s a, structures and pointer operations, Implem plementation, polyn Lists h array implementation. Linked lists. Implem	rs. ienting nomial Types ienting	Week 1 1
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6.	Recursion: Recursion, Recursion and Stacks. Expression	
0.	evaluation using stacks.	
7.	Non-Linear Data Structures:	4
7.	Non-Linear Data Structures.	+
	Introduction to Trees, Implementation of Trees, Binary Trees,	
	Tree Traversals with an Application, Binary Search Trees	
	(BSTs), Query and Update Operations on BSTs, static and	
	dynamic implementation. Tree operations, insert, delete, and	
	search.	
	Heaps: Definition and Implementation of Max and Min Heap.	
	Priority Queue ADT, Binary Heap Implementation and	
	Applications of Priority Queues	
8.	Hashing: Implementation of Dictionaries, Hash Function,	2
	Collisions in Hashing, Separate Chaining, Open Addressing.	
9.	Sorting Algorithms: Stability and In Place Properties, Insertion	3
	Sort, Merge Sort, Quick Sort, Heap Sort, Lower Bound for	
	Comparison Based Sorting Algorithms,	
	Linear Sorting Algorithms: Counting Sort, Radix Sort, Bucket	
10	Sort	3
10.	Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth	3
	First Search (DFS), Applications of BFS and DFS, Minimum	
	Spanning Trees (MST), Prim's and Kruskal's algorithms for	
	MST, Connected Components, Dijkstra's Algorithm for Single	
	Source Shortest Paths. Tree Traversals.	
11.	Storage Management: Memory Management techniques,	1
	garbage collection.	
	Text Books	
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Cl	ifford Stein,
	Introduction to Algorithms, Second Edition, PHI, 2009.	
2.	Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, Fundame	entals of
	Computer Algorithms, Second Edition, Universities Press, 2011.	
3.	Data Structures by Rajni Jindal	
4.	Data Structures - Schaum's Series	
	References	
1.	Data Structures by Knuth	
2.	Data Structures by Farouzan	
3.	Data Structures using C and C++ by Langsam, Augestern, Tanenba	ium.

		Department of Compute		-	
Course	Title	National Institute of Data Structures Lab	Technology Srinag Semester	4^{th}	
Departr		Computer Science &	Course Code	CST2	51
Departi	iiciit	Engineering	Course Coue	0.012	
Credits		01	L	Т	Р
Course	Tvne	Lab	0	0	2
course	<u>- , pc</u>		Objectives	0	
• 1	Develop	ADT for stack and queue appl	v		
	-	ent tree and graph algorithms	leations		
	-	ent and analyse internal and ext	ernal sorting algorith	ims	
	-	and implement symbol table usi	00		
• 1	Jesigii d		Outcomes	C	
Basic co	ncents	of data, linear lists, strings, arra		sts renrese	ntation of trees
	1	ge systems, Arrays, Recursion,		· 1	
	-	Free Traversal, Symbol Table a	-		•
Graphs.	11005, 1	free fraversal, Symbol fable a	ind Searching Teenin	iques, som	ing reeninques
Oraphs.		Course	Synopsis		
To enab	le a stud	lent to have a practical comman		learned in	the course
			ine / Content		the course.
T Tac 24	1		ine / Content		
I I MIT		Lonics			Week
<u>Unit</u>	Imple	Topics ement singly and doubly linked	lists		Week
<u>Unit</u> 1.	Imple	ement singly and doubly linked	lists.		Week 1
1.	-	ement singly and doubly linked		us for	<u>Week</u> 1 1
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1.	Repre	ement singly and doubly linked		is for	1
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Hazratbal, Srinagar, Kashmir, 190006 India.



5th Semester

Computer Science & Engineering

		Department of Computer	6	ng	
<u>a</u>	T • 4 1	National Institute of Te		5 th	
Course 7	litle	Computer Organization &	Semester	5	
		Architecture		00720/	-
Departn	nent	Computer Science &	Course Code	CST305	>
a 114		Engineering		T	
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Course 7	Гуре	Theory	3	I	0
		course Ob erstand the basics of computer	,		
 C T au C T p T T T T Upon con U S fl S fl S n s 	ompute o descr nd thei operatio o stud ipelinin o stud nemory o stud nterface mpletic underst tudy th loating- tudy th tudy th	ers and their peripherals. ribe arithmetic and logical operation in representation in computers and ons. by basic processing unit and orgonian and other large computing system by hierarchical memory system by different ways of communic es. Learning O on of the course the student will be and the basic structure and operation the design of arithmetic and logic point arithmetic operations; the two types of control unit technic the hierarchical memory system control unit technic the different ways of communication communication the different ways of communication comm	ions with integer and f nd implement the Ha ganization of simple tems. as including cache r cating with I/O device utcomes e able to: ion of digital compute unit and implementat ques and the concept on n including cache r	floating-J rdware f processo memorie ces and er; tion of fi pipelin memorie	point operand for Arithmetic or, concept o s and virtua standard I/C ixed point and hing; s and virtua
	iterface	5	cating with 10 devi	ees and	standard 1/C
		Course Sy	nopsis		
		asic digital building blocks; Nur ncept of sub-routine; Memory org			
	1	Course Outline	e / Content	,	
Unit		Topics			Week
1.	struct Clock Num and lo	duction: Overview of basic digitation of a digital computer. Basic Rate, Performance Measurement ber system and representation of ogical operation, hardware implementation for and floating point, IEEE754 representation of the system of the	ic Performance Equa t. of information, arithn mentation, Real numb	tion, netic	3
2.	path Exter routin	Subblock: Datapath - ALU, Reg – microprogramming (only the nal interface. Various addressing the and sub-routine call. Use of the call and return, instruction inter	e idea), hardwired lo g modes. Concept of stack for handling	ogic; sub- sub-	3

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3.	Memory Subblock: Memory organization; concepts of semi-	
	conductor memory, CPU memory interaction, organization of	3
	memory modules, cache memory and related mapping and	
	replacement policies, virtual memory	
4.	Pipelining: Introduction to pipelining, Instruction pipeline,	
	Arithmetic pipeline, Data hazards, instruction hazards,	2
	performance considerations.	
5.	I/O Subblock: I/O techniques - interrupts, polling, DMA;	
	Synchronous vs. Asynchronous I/O; Controllers.	3
	Introduction to VHDL concepts: examples to be taken up from	
	the rest of the course for implementation.	
	Text Books	
1.	Computer Organization, Hamachar, Vranesic & Zaky.	
2.	Circuit Design with VHDL, Volnei Pedroni.	
	References	
1.	Vincent. P. Heuring, Harry F. Jordan -Computer System design	and Architecture
	2nd edition, Pearson, 2003.	
2.	Apman, Gabriele Jost, Ruud van van der Pas, -Using OpenMP:	Portable Shared
	Memory ParallelProgramming (Scientific and Engineering C	
	edition, MIT Press, 2007.	omputation), 15t
3.	H. J. Siegel.Interconnection Network for Large Scale Parallel Prod	cessing, McGraw
	Hill, 1990.	

		Dep artment of Co	-	0	0	
		National Institu			ar	
Course '	Title	Design and Analysis of	f So	emester	5 th	
		Algorithms				
Departn	nent	Computer Science &	C	ourse Code	CST3	306
		Engineering				
Credits		04		L	Т	P
Course '	Туре	Theory		3	1	0
		Co	ırse Objectiv	es		
• 1	o under	stand asymptotic notati	ons to analyze	the perforn	nance of al	lgorithms.
		stand and apply vario	•	-		-
		greedy algorithm, dyna	-	-	1	
	-	given problem by sel		-	gorithm d	esign technique
		Ey the selection.	coung the up	propriate ai	Southing a	esign teeninque
	•	the concepts of P, NP,	NP-hard and l	NP-complet	e problem	2
• 1		<u> </u>	rning Outcon	*		
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	0	od principles of algorith	0	4 - 41		. 1
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		(in easy cases);	C 1 .			
		the asymptotic perform				
		orous correctness proof	0			
		familiar with fundame				
		ta structures can bes				stomed to the
	-	on of algorithms in both	n functional ar	d procedurs	1 atulaa	
	earn h	we to apply their the		-	•	
с			oretical know	-	•	ia the practical
		nt of the course).	oretical know	-	•	ia the practical
		nt of the course).	oretical know	ledge in p	•	ia the practica
Basic str	ompone	nt of the course).	ourse Synopsi	vledge in p	ractice (vi	
	ompone rategies	nt of the course).	ourse Synopsi op-down desi	vledge in p s gn, divide a	and conqu	er, average and
worst-ca	ompone rategies se crite	nt of the course). Co of algorithm design: t ria, asymptotic costs.	ourse Synopsi op-down desi Simple recur	vledge in p s gn, divide a rence relatio	and conquions for as	er, average and symptotic costs
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	Greedy Algorithms: Overview of the greedy paradigm,	
	examples of exact optimization solution (minimum cost	
	spanning tree), approximate solution (Knapsack problem),	
	single source shortest paths.	
3.	Dynamic Programming : Overview, difference between	2
5.	dynamic programming and divide and conquer, applications: shortest path in graph, matrix multiplication, travelling salesperson problem, longest common sequence.	2
4.	Graph Algorithms: Graphs and their Representations, Graph	
	Traversal Techniques: Breadth First Search (BFS) and Depth	
	First Search (DFS), Applications of BFS and DFS, Minimum	
	Spanning Trees (MST), Prim's and Kruskal's algorithms for	3
	MST, Connected Components, Dijkstra's Algorithm for Single	5
	Source Shortest Paths, Floyd's Algorithm for All-Pairs Shortest	
	Paths Problem.	
5.	Back Tracking: Overview, 8-Queens problem and Knapsack	
	problem.	
	Branch & Bound: LC searching, bounding, FIFO branch and	2
	bound, Applications: 0/1 Knapsack problem, Travelling	
	salesperson problem.	
6.	Computational complexity: Complexity measures, Polynomial	
	vs non-polynomial time complexity; NP hard and NP complete	1
	classes, Examples.	
	Text Books	
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and	l Clifford Stein,
	"Introduction to Algorithms", PHI.	
2.	Mark Allen Weiss, "Data Structures and Algorithm Analysis	in C++", Third
	Edition, Pearson Education, 2006	
3.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "F	undamentals of
	Computer Algorithms", Second Edition, Universities Press, 2011	
4.	Anany Levitin. "Introduction to the Design and Analysis	of algorithms",
	Pearson.	
	References	
1.	Steven S Skiena, "The Algorithm Design Manual" – Springer Pub	olications
2.	Knuth, "The Art of Programming", Addison Wesley Vol I and II	
3.	Michael T Goodrich, "Algorithm Design" WILEY Publications.	
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		Department of Computer	0	ing	
Course T	itle	National Institute of T Microprocessor	Semester	5 th	
	IIIC	ineroprocessor	Semester	5	
Departm	ent	Computer Science &	Course Code	CST307	
		Engineering			
Credits		03	L	Т	Р
Course T	ype	Theory	3	0	0
		Course O	*		
• To	ounder	stand the basic Structure and O	perations of microcon	nputer and	
• To	o fami	liarize basic architecture of	8085 microprocesso	ors and pr	ogram 808
M	icropro	cessor using Assembly Level L	Language.		
• To	under	stand the System bus structure	and its different opera	tions.	
• To	under	stand interfacing of 16 bit micr	roprocessor with mem	ory and per	ripheral chip
		system design.	I	J	I I I I
		arize basic architecture of 8086	6 microprocessor		
• 10	/ Iaiiiii		5 meroprocessor		
		Learning (Outcomes		
• W	rite pro	ograms to run on 8085 micropro	ocessor based systems.		
• De	esign	system using memory chips	s and peripheral cl	nips for 1	l6 bit 808
mi	cropro	cessor.			
• Ur	ndersta	nd and devise techniques for fa	aster execution of inst	ructions, ir	mprove speed
of	operat	and anhouse neuformore	с ·		
	-	ions and enhance performance	-		
• Di	stingui	sh between RISC and CISC pro	ocessors.		
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• Di • Ur	stingui ndersta	sh between RISC and CISC pro nd multi core processor and its Course S	ocessors. advantages. Synopsis		
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	Subsystem	
6.	Introduction to 8086 architecture: Main features and addressing	2
	modes, difference between 8085 and 8086.	
	Text Books	
1.	Microprocessor by Goankar	
2.	Microprocessor by Douglas Hall	
	References	
1.	8086/8088 family: Design Programming and Interfacing: John Uffenbe	eck.

	Department of Computer Sc National Institute of Tech	0	0	
Course Title	Microprocessor Lab	Semester	5 th	
Department	Computer Science & Engineering	Course Code	e CST308	
Credits	01	L	Т	Р
Course Type	Lab	0	0	2

Course Objectives

- To become familiar with the architecture and Instruction set of Intel 8085 microprocessor.
- To expose students, to the operation of typical 8085 microprocessor trainer kit.
- To provide practical hands on experience with Assembly Language Programming.
- Develop and test assembly language programs to use instructions of 8085.
- Get familiarize with interfacing of various peripheral devices with 8085 using 8279 chip.

Learning Outcomes

By the end of this course, the students will be able to run programs on 8085 microprocessor based systems.

	Course Synopsis						
To enabl	le a student to have a practical command over the concepts learned ir	the course.					
	Course Outline / Content						
Unit	Unit Topics						
1.	Develop a program to add two double byte numbers.Develop a subroutine to add two floating point quantities.	1					
2.	Develop program to multiply two single byte unsigned numbers, giving a 16 bit product.	1					
3.	Develop subroutine which will multiply two positive floating point numbers.	1					
4.	Write program to evaluate $P^* Q^* + R^* \& S$ are 8 bit binary numbers.	1					
5.	Write a program to divide a 4 byte number by another 4 byte number	1					
6.	Write a program to divide an 8 bit number by another 8 bit number up to a fractional quotient of 16 bit	1					
7.	Write a program for adding first N natural numbers and store the results in memory location X.	1					
8.	Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.	1					
9.	Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.	1					
10.	N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.	1					

11.	Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a program by which the data stored in a RAM table is displayed.	1
12.	Design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.	1
13.	 Design and interface a circuit to convert digital data into analog signal using the 8255 A in the memory mapped I/O. Interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer. 	1
14.	Design a circuit to interface a memory chip with microprocessor with given memory map.	1
	Text Books	
1.	Microprocessor by Goankar	
2.	Microprocessor by Douglas Hall	
	References	
1.	8086/8088 family: Design Programming and Interfacing: John Uffe	enbeck

			iter Science & Engir	0		
<u>a</u>			of Technology Srina			
Course		Operating System	Semester	5 th		
Departr	nent	Computer Science &	Course Cod	e CS	T309	
		Engineering	T			D
Credits		04	<u> </u>			<u>P</u>
Course	Type	Theory	-	1		0
	Co ve do		e Objectives			
		rstand the services provided rstand the structure and orga		1	ng syste	em.
		rstand what a process is and			d and so	cheduled.
		rstand different approaches t				
		s should be able to use system			, memor	y and the
	ïle syste	-				•
• 5	Students	s should understand the data	structures and algorithm	ithms use	d to im	plement a
(DS.					
			ng Outcomes			
-		this course the students should	1	ollowing	capabil	ities:
		eciation of the role of an ope				
		aware of the issues in the n	nanagement of resour	rces like j	processo	or, memor
	-	it-output.				
		be able to select appropria		incing to	ols or i	utilities fo
	-	needs like filters or version c				
• (Dhtain s	ome incight into the decign c				
- (Jotams		of an operating system	1.		
		Cours	se Synopsis			
The cou	ırse wi	Cours Il provide an introduction	se Synopsis to Operating System	ms (OS),		
The cou impleme	irse wi entation	Cours 11 provide an introduction . We will discuss the goal	to Operating System s of an OS, and so	ms (OS), ome succ	essful a	and not-so
The cou impleme successf	urse wi entation ful OS	Cours Il provide an introduction . We will discuss the goal designs. We will also disc	to Operating System to Operating System ts of an OS, and so uss the following OS	ms (OS), ome succ S service	essful a s in de	and not-so tail: thread
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6.	Memory Management: Base machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Organization, Impact on performance.	2
7.	I/O Management & Disk Scheduling: I/O devices and organization of I/O function, I/O Buffering, DISK I/O, Operating System Design Issues.	2
8.	File System: File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues.	2
	Text Books	
1.	J. Peterson, A. Silberschatz, and P. Galvin. Operating System Cond Wesley, 3rd Edition, 1989.	cepts, Addison
2.	Andrew S. Tannenbaum, "Modern Operating Systems", Prentice H	Iall.
3.	William Stallings "Operating Systems – Internals and design princ Hall	
	References	
1.	D.M Dhamdhere: Operating systems - A concept based Approach, Tata McGraw- Hill, 2012.	3rd Edition,
2.	P.C.P. Bhatt: Introduction to Operating Systems Concepts and Pra Edition, PHI, 2010	ctice, 3rd
3.	Harvey M Deital: Operating systems, 3rd Edition, Pearson Educati	on, 2011.

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3.	Wesley J Chun, "Core Python Applications Programming", 3rdEdition,Pearson
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4.	Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data
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	Structures and Algorithms in Python",1stEdition, Wiley India Pvt Ltd, 2016.
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	Department of Computer Sci		ng	
Course Title	National Institute of Tech		5 th	
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	1st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.drchuck. com/pythonlearn/EN_us/pythonlearn.pdf) (Chapters 1 – 13, 15)
2.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2ndEdition, Green Tea Press, 2015.
	(http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Chapters 15, 16, 17)
	References
1.	Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
2.	Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011.ISBN-13: 978-9350232873
3.	Wesley J Chun, "Core Python Applications Programming", 3rdEdition,Pearson Education India, 2015. ISBN-13: 978-9332555365
4.	Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python",1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176
5.	Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python",1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176

		Department of Computer Sci	0	0	
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Course		Data Communication	Semester	-	212
Depart		Computer Science & engineering			
Credits		04	L	<u> </u>	<u> </u>
Course	Туре	Theory Course Object	3	1	0
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8.	Data communication network: Basic concept of network, Advantages and applications, Types of networks (LAN, MAN and WAN), Different network topologies like star, ring, hybrid, tree.	2				
	Text Books					
1.	William Stallings: Data & Computer Communications, 7th Ed, PH	Ι				
2.	Andrew Tanenbaum, "Computer Networks" PHI					
	References					
1.	Sklar, "Digital Communications fundamentals & Applications"2nd	l Ed Pearson Pub				
2.	Keizer, "Local Area Networks" McGraw Hill					

National Institute of Technology Srinagar

Hazratbal, Srinagar, Kashmir, 190006 India.



6th Semester

Computer Science & Engineering

		Department of				
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Course		Artificial Intelligen		Semester	6 th	
Departi	ment	Computer Science	&	Course Code	CST3	352
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			Course Syno			
		l history of AI; Kno	wledge represe	entation; Inferen	nce mecha	inisms; Machin
Learnin	g and Ex	xpert systems.				
		Co	urse Outline /	Content		
Unit			Topics			Week
1.	Intro	• • • • • • • • • • • • • • • • • • •				
		duction to A			Systems	2
	: Intro	duction to AI-Probl	em formulation	n, Problem Def	inition -	2
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	Learning- Machine learning, adaptive Learning.	
5.	Expert Systems : Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.	3
	Text Books	
1.	Deepak Khemani. A First Course in Artificial Intelligence Education (India), 2013	, McGraw Hill
2.	Stuart Russell and Peter Norvig.ArtificialIntelligence: A Moder Edition, Prentice Hall, 2009.	n Approach, 3rd
	References	
1.	Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory a Morgan Kaufmann, 2011.	and Applications,
2.	John Haugeland, Artificial Intelligence: The Very Idea, A Brac MIT Press, 1985	lford Book, The
3.	Pamela McCorduck, Machines Who Think: A Personal Inquiry and Prospects of Artificial Intelligence, A K Peters/CRC Press; 2 d	•
4.	Zbigniew Michalewicz and David B. Fogel. How to Solve It: Mo Springer; 2nd edition, 2004.	odern Heuristics.
5.	Judea Pearl. Heuristics: Intelligent Search Strategies for Co Solving, Addison-Wesley, 1984.	mputer Problem

		Department of Computer S National Institute of To			
Course	Title	Artificial Intelligence Lab	Semester	6 th	
Departi	artment CSE Course Code		e CST353		
Credits		01	L	Т	Р
Course	Туре	Lab	0	0	2
		Course Ob	jectives		
•	Го unde	rstand the concepts of Artificial	intelligence and ma	achine lear	ning.
• [To unde	rstand and practice prolog and p	ython.		
• [To unde	rstand and practice various class	sifiers like SVM and	d neural ne	tworks.
• [Го unde	rstand and practice logic and rea	asoning through log	ic program	iming.
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Unit 1. 2.	Hands o Study Write Solve	n experience on applying variou Course Outling Topics of PROLOG. a program to solve 8 queens' pr	is classifiers on MN e / Content roblem earch.	IIST datase	et.
Unit 1. 2. 3.	Hands o Study Write Solve Solve	n experience on applying variou Course Outling Topics of PROLOG. a program to solve 8 queens' pr any problem using depth first s any problem using best first sea 8-puzzle problem using best fir	roblem erch. st search	NIST datase	et.
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Course T		Computer Networks	Semester	÷	= 1
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cl	assifying	networks			
• •			Outcomes		
-	-	of the course the student will			
		d analyse the hardware, sof	tware, components of a	network a	and the
	terrelation				
	-	working protocols and their			
		otocol models and select ap	propriate protocols for a	a particula	r design.
	-	lutions for networking			
		ncepts and theories of netwo	rking and apply them to	various s	ituations,
cl	assifying		n		
The cour	o eime to	familiarise the student with	Synopsis	rotocola	nd the
internet.		Tammarise the student with	networking concepts, p		
internet.		Course Outl	ine / Content		
Unit		Topic			Week
1.	Basic	concept of network: A		ations	1
1.		of networks (LAN, MAN a			1
	• 1	gies like star, ring, hybrid, t			
2.	-	ork Protocol Architectu		nodel.	1
		s of the OSI model. Ph		,	-
	-	port, Session, Presentation a	-	7	
3.	-	ork Switching Techniques	11 0	essage	2
		ing and packet switched ne		U	
	circuit	services, Frame relay, ATM	1		
4.		and Error Control: Stop a		U	2
		w flow control, error control	-	-	
		&-wait ARQ, Go back by N			
5.		ng algorithms: Routing t			2
		hm, classification, optim			
		st path algorithm, Dijkstra			
		g, random routing, adaptive	e routing, distance vector	or and	
	link st	g, random routing, adaptive ate algorithm. estion Control: Congestior	-		

	service.	
6.	Medium Access Control Protocols: TDMA, FDMA, CDMA,	2
	ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Ethernet,	
	Token Ring network	
7.	Network security: Need for network data security, plaintext,	2
	cyphertext, encryption techniques, substitution, transposition,	
	DES encryption standard, Private key, public key,	
	Authentication.	
8.	Internetworking and Internet fundamentals: Network	2
	Interconnections, Bridges, Routers, Internet Concepts, Brief	
	concepts about common Channel signalling and Integrated	
	DigitalNetworking.	
	Text Books	
1.	William Stallings: Data & Computer Communications, 7th Ed, PI	Η
2.	Andrew Tanenbaum, —Computer Networks, PHI	
3.	Peterson and Davie, "Computer Networks, A Systems Approach"	', 5th ed.,
	Elsevier, 2011	
	References	
1.	Keizer, — Local Area Networks, McGraw Hill	
2.	Sklar, —Digital Communications fundamentals & Applications	2nd Ed Pearson
	Pub.	
3.	Ying-Dar Liu, Ren-Hung Hwang, Fred Baker, "Computer Netwo	rks: An Open
	Source Approach", McGraw-Hill, 2011.	-

		Department of Compute	6	0	
a			Technology Srinagar	6 th	
Course		Computer Networks Lab	Semester	-	,
Departr	nent	Computer Science &	Course Code	CST355	
Credits		Engineering 01	L	T	P
Course	Type	Lab	0	0	2
course	турс		Objectives	0	
• 7	To gain	a firm understanding of networ	v	in the cour	se work by
	-	l demonstration.	iking concepts learned	in the cour	se work by
-		vorking knowledge of the pr	otocols to be used a	t vorious	lovale of th
	rchitec		olocois lo de useu a	it various	levels of u
u			Outcomes		
The stud	lent sho	buld be able to:	outcomes		
		AN for home, office and simila	ar configurations		
	-	he network by installing of fire	0	y measures	
				5	
		Course	Synopsis		
The obj	ective	of the lab course to familiaris		orking cor	cepts from
practical	perspe				
		Course Outl	ine / Content	I	
Unit		Topics			Week
1.		luction & Network Wire Crimp	oing		1
2.	Ether				1
3.		n Ring			1
4.		hed LANs			1
5.		ork Design			1
6.	ATM				1
7.	1	Routing Information Protocol			1
8.		F: Open Shortest Path First Transmission Control Protocol	1		1
<u>9.</u> 10.		ing Disciplines	l		1
10.		P: Resource Reservation Protoc	ol		1
11.		alls and VPN	01		1
1.		cations			2
	<u> ۲۲</u>		Books	I	
1.	Willia	am Stallings: Data & Computer		Ed, PHI	
2.		ew Tanenbaum, —Computer N			
3.		son and Davie, "Computer Netw		roach", 5th	ed., Elsevier
	2011	-			
			rences		
1.		er, — Local Area Networks, Mo			
2.		, —Digital Communications fu	ndamentals & Applica	tions 2nd E	d Pearson
	Pub.				
3.		Dar Liu, Ren-Hung Hwang, Fr	1		

		Department of Compute		-	
n	T:41 -		Technology Srinagar	6 th	
Course		Theory of Computation	Semester	-	57
Depart	ment	Computer Science & Engineering	Course Code	CST3	50
Credits		04		Т	Р
Course		Theory	3	1	0
course	турс		Objectives	1	0
• • ⁻	Employ To desig	machines by their power to r finite state machines to solve n grammars and recognizers hend the hierarchy of proble	e problems incomputing for different formal lar	iguages	ices.
			Outcomes		
		g this course, the student show			
		and various Computing mo	odels like Finite State	e Machi	ne, Pushdown
		a, and Turing Machine;			
• 1	Underst	and Decidability and Undecid		ems.	
~			Synopsis		
		computations; theorems and p			
pushdov	vn autor	nata; concepts in parsing; Tu		xity theo	ory.
			line / Content		
Unit	-	Topics			Week
1.	comp	duction: Complexity of utability, complexity, manology, definitions, theorems	athematical notions	and	3
				JUIS.	
2					3
2.	Auto	nata & Languages: Finite A	Automata, Non-determi		3
	Autor regula	nata & Languages: Finite A r expressions, non-regular ex	Automata, Non-determi pressions	nism,	3
2. 3.	Autor regula Conte autor	nata & Languages: Finite A	Automata, Non-determi pressions t free grammar, push	nism, down	3
	Autor regula Conte autor prope Comj mach reduc	nata & Languages: Finite A r expressions, non-regular ex ext free languages: contex hata, non-context free langu rties, concepts in parsing. Dutability theory: Turing m nes, the definition of bility, advanced topics in con	Automata, Non-determi spressions t free grammar, push hages, equivalences, cl machines, variants of T Algorithm, Decida	nism, down osure 'uring bility,	-
3.	Autor regula Conta autor prope Comp mach reduc theore Comp	nata & Languages: Finite A r expressions, non-regular ex ext free languages: contex hata, non-context free langu rties, concepts in parsing. Dutability theory: Turing m nes, the definition of ibility, advanced topics in con- em etc. Dexity theory- time comp	Automata, Non-determi pressions t free grammar, push ages, equivalences, cl machines, variants of T Algorithm, Decidal mputability theory- recu	nism, down osure `uring bility, ırsion	3
3.	Autor regula Conta autor prope Comp mach reduc theore Comp	nata & Languages: Finite A r expressions, non-regular ex ext free languages: contex hata, non-context free langu rties, concepts in parsing. Dutability theory: Turing m nes, the definition of bility, advanced topics in con em etc.	Automata, Non-determi pressions t free grammar, push ages, equivalences, cl machines, variants of T Algorithm, Decidal mputability theory- recu	nism, down osure `uring bility, ırsion	3
3.	Autor regula Conta autor prope Comp mach reduc theore Comp	nata & Languages: Finite A r expressions, non-regular ex ext free languages: contex hata, non-context free langu rties, concepts in parsing. Dutability theory: Turing m nes, the definition of ibility, advanced topics in con- em etc. Dexity theory- time comp tability.	Automata, Non-determi spressions t free grammar, push lages, equivalences, cl hachines, variants of T Algorithm, Decidal mputability theory- recu plexity, space compl	nism, down osure `uring bility, ırsion	3
3.	Autor regula Conta auton prope Comj mach reduc theore Comj intrac	nata & Languages: Finite A ar expressions, non-regular ex ext free languages: contex hata, non-context free langu rties, concepts in parsing.outability theory: Turing m nes, the definition of ibility, advanced topics in con- em etc.olexity theory- time comp tability.Textpadimitrou and C. L. Lewis. F	Automata, Non-determi spressions t free grammar, push lages, equivalences, cl nachines, variants of T Algorithm, Decida mputability theory- recu plexity, space compl Books	nism, down osure 'uring bility, ursion exity,	3 3 2
3. 4. 5.	Autor regularegulacontaautonpropeComjmachreductheoreComjintrace	nata & Languages: Finite A ar expressions, non-regular ex ext free languages: contex hata, non-context free langu rties, concepts in parsing.outability theory: Turing m nes, the definition of ibility, advanced topics in con- em etc.olexity theory- time comp tability.Textpadimitrou and C. L. Lewis. F	Automata, Non-determi spressions t free grammar, push lages, equivalences, cl hachines, variants of T Algorithm, Decida mputability theory- recu plexity, space compl Books Elements of Theory of C	nism, down osure 'uring bility, ursion exity, Computa	3 3 2
3. 4. 5.	Autor regularegulacontaautonpropeComjmachreductheoreComjintrace	mata & Languages: Finite A ar expressions, non-regular ex ext free languages: contex ata, non-context free langu rties, concepts in parsing. outability theory: Turing m nes, the definition of bility, advanced topics in cong ext free of etc. olexity theory- time comp tability. Text padimitrou and C. L. Lewis. F 981. topcroft and J.D. Ullman. Intr	Automata, Non-determi spressions t free grammar, push lages, equivalences, cl hachines, variants of T Algorithm, Decida mputability theory- recu plexity, space compl Books Elements of Theory of C	nism, down osure 'uring bility, ursion exity, Computa	3 3 2
3. 4. 5.	Autor regula Conte autor prope Comj mach reduc theore Comj intrac C. Pa Hall, J J.E. H	mata & Languages: Finite A ar expressions, non-regular ex ext free languages: contex ata, non-context free langu rties, concepts in parsing. outability theory: Turing m nes, the definition of bility, advanced topics in cong ext free of etc. olexity theory- time comp tability. Text padimitrou and C. L. Lewis. F 981. topcroft and J.D. Ullman. Intr	Automata, Non-determi spressions t free grammar, push lages, equivalences, cl hachines, variants of T Algorithm, Decida mputability theory- recu plexity, space compl Books Elements of Theory of C coduction to Antomata 7 rences	nism, down osure `uring bility, ursion exity, Computa	3 3 2 tion, Prentice-

		Department of Comput	e	0	
Course	Titlo	Computer Graphics	Technology Srinagar Semester	6 th	
Departi		Computer Science &	Course Code	CST35	57
Departi	пспі	Engineering	Course Coue	C515.	, ,
Credits		04	L	Т	Р
Course		Theory	3	1	0
	J		Objectives		1
•	Students	s will demonstrate an understa	anding of contemporary	graphics	s hardware
		basicterminology, scope and	• • •		
				-	
		trate and implement the 2D p	00		
		trate area filling algorithms, l		long with	n various 2D
t	ransform	mations2D viewing and Coor	dinate representations.		
• 1	Underst	and the 3D graphic primitives	s along with various Tra	ansformation	tions and
(Other al	gorithmsand Projection Tech	niques for representing	3D graph	nic objects
			1 1 0	0 1	5
			Outcomes		
		s will have an understanding		gorithms	including: line
	-	, polygon filling, clipping, an			
		s will understand the techniq			
	iowing	transformations, hierarchic	al modelling colour	1. 1.	
	viewing	transformations, merarente	ai modennig, colour,	, lighting	g and texture
	napping	5.		, lighting	g and texture
1	napping	g. Course	Synopsis		
ntroduc	mapping	g. Course graphics primitives; geome	Synopsis etric transformation; p		
ntroduc	mapping	g. Course graphics primitives; geome ding models; picture synthesis	Synopsis etric transformation; p s and analysis.		
ntroduc projectio	mapping	g. graphics primitives; geome ling models; picture synthesis Course Out	Synopsis etric transformation; p s and analysis. line / Content		nd perspective
ntroduc projection	mapping ction to on; Shao	g. graphics primitives; geome ding models; picture synthesis Course Out Topics	Synopsis etric transformation; p s and analysis. line / Content s	arallel a	
ntroduc projectio	mapping etion to on; Shao Intro	g. graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represes	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S	arallel an	nd perspective
introduc projection Unit	mapping etion to on; Shao Intro Rando	g. graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represes om Scan methods, colour CF	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics,	arallel an	nd perspective Week
ntroduc projectio Unit	mapping etion to on; Shad Intro Rando basics	g. graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represent om Scan methods, colour CF s, interactive devices, graphic	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de	arallel an can & video evices,	nd perspective
Introduc projection Unit	mapping etion to on; Shao Intro Rando basics mous	g. graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de	arallel an can & video evices,	nd perspective Week
Introduc projection Unit 1.	mapping etion to on; Shao Intro Rando basics mouse graph	g. graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represer om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics.	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste	arallel an can & video vices, r scan	nd perspective Week
introduc projection Unit	mapping etion to on; Shao Intro Rando basics mouse graph Grap	g. graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represes om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitizities. hics Primitives: 2D Primiti	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste ives - Output primiti	arallel an can & video evices, r scan ves –	nd perspective Week
Introduc projectio Unit 1.	mapping etion to on; Shao Intro Rando basics mouse graph Grap Line,	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de er, thumb wheel, raste ives - Output primiti g algorithms - Attribu	arallel an can & video vices, r scan ves – tes of	nd perspective Week 2
Introduc projectio Unit 1.	mapping etion to on; Shao Intro Rando basics mouse graph Line, outpu	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represes om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimensior	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste ives - Output primiti g algorithms - Attribu	arallel an can & video vices, r scan ves – tes of nation	nd perspective Week
Introduc projectio Unit 1.	mapping etion to on; Shao Intro Rando basics mouse graph Grap Line, outpu - Two	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste ives - Output primiti g algorithms - Attribu	arallel an can & video vices, r scan ves – tes of nation	nd perspective Week 2
Introduc projection Unit 1. 2.	mapping etion to on; Shao Intro Rando basics graph Grap Line, outpu - Two clippi	graphics primitives; geome ding models; picture synthesis Course Out Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimensior o dimensional viewing –Line ng algorithms.	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de eer, thumb wheel, raste ives - Output primiti g algorithms - Attribu nal Geometric transform e, Polygon, Curve and	arallel an can & video vices, r scan ves – tes of nation l Text	nd perspective Week 2
Introduc projectio Unit 1.	mapping tion to on; Shad Intro Rando basics mouse graph Line, outpu - Two clippi Paral	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represes om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimensior o dimensional viewing –Line ng algorithms. lel and Perspective pro	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste ives - Output primiti g algorithms - Attribu nal Geometric transform e, Polygon, Curve and jections:Three dimen	arallel an can & video vices, r scan ves – tes of nation I Text sional	nd perspective Week 2 3
Introduc projection Unit 1. 2.	mapping etion to on; Shao Intro Rando basics mouse graph Line, outpu - Two clippi Paral object	graphics primitives; geome ding models; picture synthesis Course Out Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. lel and Perspective pro	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de eer, thumb wheel, raste ives - Output primiti g algorithms - Attribu hal Geometric transform e, Polygon, Curve and jections:Three dimen s, Curved lines, Sp	arallel an can & video vices, r scan ves – tes of nation l Text sional olines,	nd perspective Week 2
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Introduc projection Unit 1. 2.	mapping tion to on; Shad Intro Rando basics mouse graph Line, outpu - Two clippi Paral object Quadi transf	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represer om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. lel and Perspective pro- t representation –Polygons fic Surfaces- Visualizatio formations – Viewing -Vis	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste ives - Output primiti g algorithms - Attribu nal Geometric transform e, Polygon, Curve and jections:Three diments, Curved lines, Sp on of data sets - sible surface identific	arallel an can & video vices, r scan ves – tes of nation I Text sional olines, 3D cation.	nd perspective Week 2 3
Introduc projection Unit 1. 2.	mapping etion to on; Shace Intro Rande basics mouse graph Line, outpu - Two clippi Paral object Quada transf Basic	graphics primitives; geome ding models; picture synthesis Course Out Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. Iel and Perspective pro t representation –Polygons ric Surfaces- Visualizatio formations – Viewing -Vis Raster Graphics Algorithms	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de eer, thumb wheel, raste ives - Output primiti g algorithms - Attribu hal Geometric transform e, Polygon, Curve and jections:Three dimen s, Curved lines, Sp on of data sets - sible surface identific . Geometric Modelling	arallel an can & video vices, r scan ves – tes of nation l Text sional olines, 3D cation.	nd perspective Week 2 3
Introduc projection Unit 1. 2.	mapping tion to on; Shad Intro Rando basics mouse graph Grap Line, outpu - Two clippi Paral object Quadu transf Basic D. Vi	graphics primitives; geome ding models; picture synthesis Course Out Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. lel and Perspective pro t representation –Polygons ric Surfaces- Visualizatio formations – Viewing -Vis Raster Graphics Algorithms iewing in 3-D. Concept of S	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de eer, thumb wheel, raste ives - Output primiti g algorithms - Attribu nal Geometric transform e, Polygon, Curve and jections:Three dimen s, Curved lines, Sp on of data sets - sible surface identific . Geometric Modelling Synthetic Camera. Dia	arallel an can & video vices, r scan ves – tes of nation l Text sional olines, 3D cation.	nd perspective Week 2 3
Introduction Introduction Drojection Unit 1. 2. 3.	mapping tion to on; Shad Intro Rando basics mouse graph Line, outpu - Two clippi Paral object Quadi transf Basic D. Vi Desig	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represer om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. lel and Perspective pro- t representation –Polygons fic Surfaces- Visualizatio formations – Viewing -Vis Raster Graphics Algorithms fewing in 3-D. Concept of S n. Graphics User Interfaces.	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de zer, thumb wheel, raste ives - Output primiti g algorithms - Attribu hal Geometric transform e, Polygon, Curve and jections:Three diments, Curved lines, Sp on of data sets - sible surface identific . Geometric Modelling Synthetic Camera. Dia Windowing Systems.	arallel an can & video vices, r scan ves – tes of nation I Text sional plines, 3D cation. j in 3- logue	nd perspective Week 2 3
Introduc projection Unit 1. 2.	mapping tion to on; Shad Intro Rando basics mouse graph Grap Line, outpu - Two clippi Paral object Quadi transf Basic D. Vi Desig Rend	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represe om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. lel and Perspective pro t representation –Polygons ric Surfaces- Visualizatio formations – Viewing -Vis Raster Graphics Algorithms iewing in 3-D. Concept of S n. Graphics User Interfaces. V ering: Introduction to Shadim	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de eer, thumb wheel, raste ives - Output primiti g algorithms - Attribu nal Geometric transform e, Polygon, Curve and jections:Three dimen s, Curved lines, Sp on of data sets - sible surface identific . Geometric Modelling Synthetic Camera. Dia Windowing Systems. ng models – Flat and Sp	arallel an can & video vices, r scan ves – tes of nation l Text sional olines, 3D cation. ; in 3- llogue mooth	nd perspective Week 2 3
Introduc projection Unit 1. 2. 3.	mapping tion to on; Shad Intro Rando basics mouse graph Grap Line, outpu - Two clippi Paral object Quad transf Basic D. Vi Desig Rend shadin	graphics primitives; geome ding models; picture synthesis Course Out Topics duction: Co-ordinate represer om Scan methods, colour CF s, interactive devices, graphic e, track ball, light pen, digitiz ics. hics Primitives: 2D Primit Circle and Ellipse drawing t primitives – Two dimension o dimensional viewing –Line ng algorithms. lel and Perspective pro- t representation –Polygons fic Surfaces- Visualizatio formations – Viewing -Vis Raster Graphics Algorithms fewing in 3-D. Concept of S n. Graphics User Interfaces.	Synopsis etric transformation; p s and analysis. line / Content s ntation, Pixel, Raster S RT Raster scan basics, cs input and output de eer, thumb wheel, raste ives - Output primiting algorithms - Attribute al Geometric transform e, Polygon, Curve and jections:Three diments, Curved lines, Sp on of data sets - sible surface identific . Geometric Modelling Synthetic Camera. Dia Windowing Systems. ing models – Flat and Sp – Adding shadows of o	arallel an can & video vices, r scan ves – tes of nation l Text sional olines, 3D cation. j in 3- ilogue mooth bjects	nd perspective Week 2 3

	Discrete events.					
5.	Introduction to Picture Synthesis and Analysis: Conceptual					
	Framework of an Interactive Graphical Simulation System.					
	Simulation of Discrete Event Displays, Animation Techniques,	3				
	Basic Rules for Animation. Graphical Simulation of continuous					
	motion. Role of Virtual Reality in Graphical Simulation.					
	Text Books					
1.	Computer Graphics by Hearn and Baker, PHI					
2.	Preparata, Shamos, Computational Geometry- An Introduction.					
	References					
1.	Procedural Elements for Computer Graphics by Rogers, TMH.					
2.	Mathematical Elements for Computer Graphics by Rogers and A	dams, Mac				
	Graw Hills					
3.	Computer Graphics: Schaum's Outline of Computer Graphics by	Roy A Plastock				
1.	Research papers/Journal Articles from Standard Sources					

		Department of Compute	_	-	
Comment	T:4] -	National Institute of		6 th	
Course		Computer Graphics Lab	Semester	-	
Departr	nent	Computer Science & Engineering	Course Code	CST358	8
Credits		01	L	Т	P
Course	Туре	Lab	0	0	2
		Course C	Objectives		·
• I	mpleme	ent the 2D primitive drawing algo	rithms		
• I	Demons	trate and Implement the 2D trans	formation techniques		
• I	Demons	strate and implement the 3D tra	ansformation techniqu	es	
		ent Animation scenes	-		
	I · ·				
	1 0 1		Outcomes		
		his course, the students will be		• , •	
	-	ent the algorithms for drawing		nitives.	
		lifferent kinds of transformatio	ons.		
		ree dimensional objects.			
• (Jenerat	e fractal images.	Synonsic		
Bresenh	am's	algorithms for drawing lin	Synopsis be circle and ellin	se Two	dimensional
Diesenn	ams	argonums for drawing m			
transfor	mations				
transfor	mations	s, Three dimensional transform	ations, Composite trai		
	mations	s, Three dimensional transform Course Outl	ations, Composite trai ine / Content		ns.
transform Unit 1.		s, Three dimensional transform Course Outl Topics	ations, Composite trai ine / Content	nsformatio	
Unit	Imple	s, Three dimensional transform Course Outl	ations, Composite trai ine / Content gorithm – Line, Circle	nsformatio	ns. Week
Unit	Imple Ellips Two	s, Three dimensional transform Course Outle Topics ementation of Bresenham's Alg se. Implementation of Line, Cir Dimensional transformations -	ations, Composite trai ine / Content gorithm – Line, Circle rcle and ellipse Attribu	nsformatio	ns. Week
Unit 1. 2.	Imple Ellips Two Scalin	s, Three dimensional transform Course Outle Topics ementation of Bresenham's Alg se. Implementation of Line, Cir Dimensional transformations - ng, Reflection, Shear.	ations, Composite trai ine / Content gorithm – Line, Circle rcle and ellipse Attribu	nsformatio	ns. Week 2 2 2
Unit 1. 2. 3.	Imple Ellips Two Scalin Comp	s, Three dimensional transform Course Outl Topics ementation of Bresenham's Alg se. Implementation of Line, Cir Dimensional transformations - ng, Reflection, Shear. posite 2D Transformations.	ations, Composite tran ine / Content gorithm – Line, Circle rcle and ellipse Attribu Translation, Rotation	nsformatio	ns. Week 2 2 2 2
Unit 1. 2. 3. 4.	Imple Ellips Two Scalin Comp Cohe	s, Three dimensional transform Course Outly Topics ementation of Bresenham's Alg se. Implementation of Line, Ci Dimensional transformations - ng, Reflection, Shear. posite 2D Transformations. n Sutherland 2D line clipping a	ations, Composite tran ine / Content gorithm – Line, Circle rcle and ellipse Attribu Translation, Rotation and Windowing	nsformatio	ns. Week 2 2 2
Unit 1. 2. 3. 4. 5.	Imple Ellips Two Scalin Comp Cohe Suthe	s, Three dimensional transform Course Outle Topics ementation of Bresenham's Alg se. Implementation of Line, Cir Dimensional transformations - ng, Reflection, Shear. posite 2D Transformations. n Sutherland 2D line clipping a erland – Hodgeman Polygon cl	ations, Composite tran ine / Content gorithm – Line, Circle rcle and ellipse Attribu Translation, Rotation and Windowing ipping Algorithm.	nsformatio	ns. Week 2 2 2 1 1 1
Unit 1. 2. 3. 4.	Imple Ellips Two Scalin Comp Cohe Suthe Three Scalin	s, Three dimensional transform Course Outle Topics ementation of Bresenham's Algorithm se. Implementation of Line, Cir Dimensional transformations - ng, Reflection, Shear. posite 2D Transformations. n Sutherland 2D line clipping a erland – Hodgeman Polygon cl e dimensional transformations ng.	ations, Composite tran ine / Content gorithm – Line, Circle rcle and ellipse Attribu Translation, Rotation and Windowing ipping Algorithm.	nsformatio	ns. Week 2 2 2 1 1 2 1 2
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		Department of Compute		-	
Commo	T: 41a	National Institute of		gar 6 th	
Course		JAVA Programming Computer Science &	Semester		50
Departı	nent	Engineering	Course Code	e CST3	39
Credits		03	L	T	Р
Course		Theory	2	0	2
Course	Турс		2 Dbjectives	0	
• 7	The Stu	dents will learn to create Clas		8	
		nd implement principles and c	· ·		web og
			1 0	silentation s	such as
		tion, Data Hiding, Polymorph		D 1	
	-	p programs by using inbuilt li	-		. The students
١	vill lear	n to create and handle threads	s, interfaces and app	lets.	
		^	Sumonsis		
On com	nlation	of the course the student sho	Synopsis	an integrate	d davalonmon
		write, compile, run, and tes			
		entary modifications to Java p			
			line / Content		noolems.
Unit		Topics			Week
1.	Over	view of Basic OOP Concept		riented	2
		igm: Agents, responsibility, n	5		-
	-	stances, class hierarchies (Inl	-		
	dataty	-			
	-	sion and			
	castin	g, classes and objects, constru	uctors, methods, acc	ess	
		ol, this keyword, garbage coll			
		onstructors, parameter passing		0	
		tance, super keyword, polyme	orphism- method ov	erriding,	
	abstra	ct classes.			
2.	Dook	ages and Interfaces: Definin	a Creating and Aca	ossingo	2
۷.		ige, Understanding CLASSPA			2
		ences between classes and int	1 01	Lages,	
		ace, implementing interface, a	-		
		bles in interface and extending		ng	
		ges – Java.io, Java.util.		0	
		~ ^			
3.	Exce	ption handling and multithr	eading: Concepts of	f	2
	-	tion handling, benefits of exc	1 0		
		ination or resumptive models,		-	
	-	, catch, throw, throws and fina	• •		
		ng own exception sub classes			
		ling and multitasking, thread		hreads,	
	synch	ronizing threads, daemon thre	eads, thread groups.		
4.	Fuer	t Handling: Events, Event so	urces Event classes	Fyent	1
4.		8			1
	LISICI	pard events, Adapter classes, i	-		
		ners, Delegation event model,	handling mouse and	1	1

	hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – boarder, grid, flow, card and grib bag.	
5.	Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.	2
6.	Swing: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.	2
7.	JDBC : JDBC Drivers, JDBC API,Executing statements, prepared statements and callable statements	1
	Text Books	
1.	An Introduction to programming and OO design using Java, J.Ni Hosch, John wiley& sons.	no and F.A.
2.	An Introduction to OOP, second edition, T. Budd, pearson educa	tion.
	References	
1.	Introduction to Java programming 6th edition, Y. Daniel Liang, l education.	Pearson
2.	An introduction to Java programming and object oriented applica development, R.A. Johnson-Thomson.	ation
3.	. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Edition, Pearson Education.	Cornell, seventh

National Institute of Technology Srinagar

Hazratbal, Srinagar, Kashmir, 190006 India.



7th Semester

Computer Science & Engineering

National Institute of Technology Srinagar

Course Title	Compiler Design	Semester	7 th	
Department	Computer Science & Engineering	Course Code	e CST415	
Credits	03	L	Т	Р
Course Type	Theory	3	0	0

Course Objectives

The objective of this course is to provide To understand different phases of compilation process.

- To analyse and implement various parsing techniques.
- To understand and analyse intermediate code.
- To realize the importance of code optimization and code generation

Learning Outcomes

After completion of this course the students should be able to have a basic understanding required for design of compilers.

Course Synopsis

Structure of compiler, Lexical analysis, Syntax analysis, Bottom up and top down evaluation of attributes, type checking, storage organization, intermediate code generation, basic blocks and flow graphs, register allocation, code generation, peep hole optimization, code generator generators.

Course Outline / Content

Unit	Topics	Week
1.	Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.	1
2.	Lexical analysis: Interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis, Error reporting and Implementation. Regular definition, Transition diagrams, LEX.	1

3.	Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.	2
4.	Syntax directed definitions : inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.	2
5.	Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.	2
6.	Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.	2
7.	Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls and Implementation issues.	2
8.	Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from DAGs, peep hole optimization, code generator generators, specifications of machine.	2
	Text Books	
1.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Tools, Addison-Wesley, 1988.	Techniques and
2.	C. Fischer and R. LeBlanc. Crafting a Compiler, Benjamin Cummi	ings, 1991.
	References	
1.	A. C. Holub. Compiler Design in C, Prentice-Hall Inc., 1993. Compiler Implementation in C: Basic Design, Cambridge Press.	Appel. Modern
2.	Fraser and Hanson. A Retargetable C Compiler: Design and I Addison-Wesley.	Implementation ,

National Institute of Technology Srinagar

Course Title	Compiler Design Lab	Semester	7 th	
Department	Computer Science & Engineering	Course Code	CSL416	
Credits	01	L	Т	Р
Course Type	Lab	0	0	2

Course Objectives

- To understand the implementation of lexical analyser, parser and other compiler design aspects.
- To write codes for various top-down and bottom-up parsers and verify them for correctness.
- To understand Linux Utility Lex and Yacc tools.

Learning Outcomes

After completing this course the students should be able to understand the compiler coding and working in detail.

Course Synopsis

The Lab intends to make students implement lexical analysers and code for each of the following phases of a compiler:

- Syntax Analysis
- Semantic Analysis
- Intermediate Code Generation
- Code Optimization
- Code Generation

Course Outline / Content

Unit	Topics	Week
1.	Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines.	2
2.	Simulate First and Follow of a Grammar	2
3.	Develop an operator precedence parser for a given language.	1

4.	Construct a recursive descent parser for an expression.	1
5.	Construct a LL(1) parser for an expression	2
6.	Design predictive parser for the given language	1
7.	Implementation of shift reduce parsing algorithm.	1
8.	Design a LALR bottom up parser for the given language.	1
9.	Implement the lexical analyzer using JLex, flex or lex or	1
	other lexical analyzer generating tools	
	Text Books	
1.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles,	Techniques and
	Tools, Addison-Wesley, 1988.	
2.	C. Fischer and R. LeBlanc. Crafting a Compiler, Benjamin Cumm	ings, 1991.
	References	
1		
1.	A. C. Holub. Compiler Design in C, Prentice-Hall Inc., 1993.	. Appel. Modern
	Compiler Implementation in C: Basic Design, Cambridge Press.	
2.	Fraser and Hanson. A Retargetable C Compiler: Design and	Implementation,
	Addison-Wesley.	÷ ′

National Institute of Technology Srinagar

Course Title	Network Security	Semester	7 th	
Department	Computer Science &	Course Code	CST417	
	Engineering			
Credits	04	L	Т	Р
Course Type	Theory	3	1	0
	Course Objec	tives		

- To help the students to understand important security goals in the networks-Confidentiality, Integrity, Authenticity, Non-repudiation and Availability and cryptographic techniques to implement these security goals.
- To provide a necessary review of mathematical concepts to implement different cryptographic techniques to achieve the network security goals and then provides a deeper dive to the field of cryptography- symmetric and asymmetric key cryptography and methods to implement them.
- The course provides a top down approach to explore the security implementations in different network layers-application, transport and network.

Learning Outcomes

After completion of this course the students should be able to:

- Visualize the security goals clearly in the networks.
- Analyse the basic concepts of network security to predict and classify attacks on a system/network.
- Understand and apply authentication techniques to provide secure communication.
- Assess the security threats to ICT infrastructure using modern tools such as firewalls, UTMs, etc.

Course Synopsis

Cryptography, classical encryption, Divisibility, Modular Arithmetic, Random Numbers.

Course Outline / Content

Unit	Topics	Week
1.	Introduction	1
	Review of Layered Architecture of the Network - the OSI Reference Model, Computer Security Concepts, The OSI	

	Security Architecture, Security - Attacks, Services and Mechanisms.	
2.	Cryptography Introduction: Classical Encryption Techniques	1
	Techniques for Implementing Security Goals: An Overview of Cryptography and Steganography, A brief recap of cryptographic principles and motivations for secure network, General thoughts on breaking the cryptosystems.	
3.	Review & Self Study - Mathematics for Symmetric Key Cryptography	2
	Review of important mathematical concepts: Divisibility, Modular Arithmetic, Groups and Rings. Classical Encryption Techniques - Substitution and Transposition	
4.	Random Number (PRN) Generation and Stream Cipher	2
	Random Numbers, True Random Number Generators, Pseudo Random Numbers - principles and generators, Cryptographically Secure Random Number Generators, One Time Pad, Stream Cipher- RC4	
5.	Block Ciphers - Data Encryption Standard (DES) and Advanced Encryption Standard (AES)	2
	Block Cipher Structure, Introduction to Data Encryption Standard, Triple DES - introduction, structure & implementation,	
	Fields, Finite Fields - GF(p), GF(2n) and polynomial arithmetic.	
	Advanced Encryption Standard (AES) - Introduction, structure &	
	implementation.	
6.	Block Cipher Operations	2
	Modes of Operations, Electronic Code Book Mode, Cipher Block Chaining Mode, Output Feedback Mode, Cipher Feedback Mode, Counter Mode, Enhancing the Security of Block Ciphers: Multiple Encryption, 3DES and DESX, Meet-in-the Middle Attack.	
7.	Data Integrity	2
	Introduction & Motivation, Hash Functions from Block Cipher,	

	(SHA-1 and SHA-3), Message Authentication Codes (MAC).	
8.	Review & Self Study - Mathematics for Asymmetric Key Cryptography	2
	Review of important mathematical concepts used in asymmetric key cryptography – Euclidean and Extended Euclidean Algorithm, Euler's Phi Function, Prime Numbers and Primality Testing, Euler's and Fermat's Theorem.	
9.	Asymmetric Key Cryptography	1
	Introduction & Principles of Asymmetric Key Cryptography, Different Public Key Algorithms, Introduction to RSA, RSA in Practice and Attacks, Diffe-Hellman Key Exchange.	
10.	Digital Signatures	1
	Introduction & Motivation, Principles and Applications, RSA based Digital Signature, RSA Probilistic Signature Scheme.	
11.	Mutual Trust - Key Management and User Authentication	1
	Introduction and challenges in key distribution, Symmetric Key Distribution and Agreement, Public Key Distribution, Principles of user authentication, User Authentication Protocol – Kerberos, Public-Key Infrastructure.	
12.	Security at the Application Layer	1
	Application Layer Security - Objectives, Issues and Need, Email Security, Pretty Good Privacy, Secure/Mulitpurpose Internet Mail Extension, Domain Keys Identfied Mail.	
13.	Security at the Transport Layer	1
	Web Security: Threats and Challenges, Securing Web-based transactions at the transport layer, Secure Socket Layer, Transport Layer Security, HTTPS, Combining HTTP and SSL/TLS - the secure HTTPS, Remote login, Challenges, One Possible Solution Approach – SSH, Wireless Security – TLS and WAP End-to-End Security.	
14.	Security at the Network Layer	1
	IP Security: Overview and Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptogaphic Suites.	

15.	System Security	2		
	Malwares – Virus, Worms, etc, Malicious Software and Anti-			
	malwares, Distributed Denial of Service Attacks, Intruders and			
	Intrusion Detection, Firewall Need and Characteristics, Types of			
	Firewalls and Biasing, Firewall Location and Confgurations.			
	Text Books			
1.	Stallings William: Cryptography and Network Security - Principles	s and Practice,		
	Pearson India, 6th Edition, 2014.			
References				
1		pook for		
1.	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth	book for		
1.	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth	book for		
1.		book for		
	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth Students and Practitioners, Springer, 1st Edition, 2010.			
1.	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth			
	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth Students and Practitioners, Springer, 1st Edition, 2010.			
	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth Students and Practitioners, Springer, 1st Edition, 2010. SchneierBruice: Applied Cryptography : Protocols, Algorithms An			
	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth Students and Practitioners, Springer, 1st Edition, 2010. SchneierBruice: Applied Cryptography : Protocols, Algorithms An	d Source Code		
2.	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Text Students and Practitioners, Springer, 1st Edition, 2010. SchneierBruice: Applied Cryptography : Protocols, Algorithms An In C, Wiley India, 2nd Edition, Reprint - 2013. Kurose James F and Keith W. Ross: Computer Networking: A Top	d Source Code		
2.	ChristofPaar and Jan Pelzl: Understanding Cryptography - A Texth Students and Practitioners, Springer, 1st Edition, 2010. SchneierBruice: Applied Cryptography : Protocols, Algorithms An In C, Wiley India, 2nd Edition, Reprint - 2013.	d Source Code		

National Institute of Technology Srinagar

Course Title	Network Security Lab	Semester	7 th	
Department	Computer Science & Engineering	Course Code	e CSL418	
Credits	01	L	Т	Р
Course Type	Lab	0	0	2

Course Objectives

- To understand principles of web security and to guarantee a secure network by monitoring and analysing the nature of attacks through cyber/computer forensics software/tools
- Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
- To have the ability to compare merits and demerits of different Cryptographic techniques and take decisions while securing a network

Learning Outcomes

At the end of the Lab, students should be able to :

- Analyse and evaluate the cyber security needs of an organization.
- Determine and analyse software vulnerabilities and security solutions to reduce the
- risk of exploitation.
- Measure the performance and troubleshoot cyber security systems

Course Synopsis

Implementation of Cryptography; Threats and Vulnerabilities; Understand the Tools and Techniques.

Course Outline / Content			
Unit	Topics	Week	
1.	Setting Up the System for testing purpose: Learning Basic Commands.	1	
2.	Software Requirements. Security Attacks : ARP Attacks (ARP Cache Poisoning, ARP Man in the Middle Attack).	2	
3.	IP Attacks (IP Fragmentation Attack, IP Teardrop Attack)	2	

		· · · · · ·
4.	ICMP Attacks(Ping of Death, Smurf Attack, ICMP Destination	
	Unreachable, ICMP Redirect, ICMP Source Quench)	2
		2
5.	TCP Attacks (SYN Flooding Attack, TCP RST Attack), UDP	3
	Attack.	-
6.	Understand the Tools and Techniques: IEXPRESS 2.0, CAY	
	KARAT, Damm Web Application Vulnerabilities (DWAV),	
	WebGoat, ProRat Trojan, Key Logger, Steganographer etc.	3
7.	Nmap Port Scanning: TCP Port Scanning (TCP Connect ()	3
	Scanning, TCP SYN Scan, TCP FIN Scan, XMAS Scan, TCP	
	NULL Scan)	
8.	UDP Port Scanning, Performing Stealth Scan of a Selected	2
	Computer.	
	Books	
1.	SchneierBruice: Applied Cryptography : Protocols, Algorithms An	d Source Code
	In C, Wiley India, 2nd Edition, Reprint - 2013.	

National Institute of Technology Srinagar

Course Title	Pre-Project	Semester	7 th	
Department	Computer Science & Engineering	Course Code	e CSP419	
Credits	03	L	Т	Р
Course Type	Practical	0	0	6

Course Objectives

• To enhance the student's knowledge and skills in solving problem through structured project research in order to produce a competent and productive engineer.

Learning Outcomes

Upon completion of Pre-Project, student should be able to:

- Identify and describe the problem and scope of project clearly.
- Collect, analyze and present data into meaningful information using relevant tools.
- Select, plan and execute a proper methodology in problem solving.
- Work independently and ethically.
- Present the results in written and oral format effectively.
- Identify basic entrepreneurship skills in project management

Course Synopsis

Final Year Project (FYP) is the individual project, which takes place over the two semesters. It is a mandatory subject for students to be awarded with Bachelor Degree. In the FYP, students are expected to undergo research studies which relate to the major course offered in the faculty.

The final year project consists of two parts; the first part FYP 1 is a prerequisite to the second part, FYP 2.

These two parts of FYP are under subject code CSE-705 and CSE-801 respectively.

National Institute of Technology Srinagar

Course Title	Seminar	Semester	7 th	
Department	Computer Science & Engineering	Course Code	e CSS420	
Credits	01	L	Т	Р
Course Type	Theory	0	0	2

Course Objectives

Each and every student has to deliver a seminar on recent research/technical topics related to CSE through power point presentations. Duration of presentation should be minimum of 30 minutes. Detailed breakup of marks to be decided by the course instructor depending on quality of content, presentation, answer to queries, communication skills etc.

Learning Outcomes

To promote further development of student success skills, such as reading and speaking; help students gain intellectual confidence; build in the expectation of academic success; have insight into latest research topics.

		Department of Comput	6	0	
0	(D) • (1)		f Technology Srinag		
Course		Internet & Web Design	Semester	MTech	
Depart	ment	Computer Science & Engineering	Course Code	CSL501	
Credits		02	L	T	Р
Course		Theory	1	0	2
course	1,10	· · · · · · · · · · · · · · · · · · ·	Objectives	0	
1. '	The aim	of this course is to provide yo	V	technologica	1
		ments in the field of Internet a	-	-	
	-	nensive knowledge of Internet	0 0		
	-	cations and the TCP/IP protoc		o provide Int	ernet
		ive worldwide.	tors wheely deproyed t	o provide int	cinci
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		rld Wide Web with its widesp			
		met. Therefore, this course als	o puts emphasis on ba	isic concepts	of web
(design.				
	Γ		tline / Content	1	 -
Unit		Topic	28		Week
4		duction to Internet et, Growth of Internet, Owners o	f the Internet Arrite	of	
1.		of Veb, basic	2		
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		et Terminology, Net etiquette. In Internet, Governance on the Inte			
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2.	TCP/		1		
	Packer				
), E-mail			
	Addre	sses, Resources Addresses			
3.	Interr	net Connectivity			2
		ectivity types: level one, level tw	o and level three connect	ctivity,	
		g up a connection: hardware requ			
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		ptions – Dialup connections through the connections through the tele			
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4.		net Network	ANT WITANT NY	1. 11 (2
		ork definition, Common terminol station, bandwidth, Interoperabil			
		rk security, Network Component		lor,	
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		ssing in Internet: DNS, Domain	i tunie une men organiz		
	Addre unders	standing the Internet Protocol Ac	ldress. Network topolog	ies: Bust,	
	Addre unders star ar		ldress. Network topolog	ies: Bust,	

5.	Electronic Mail Email Networks and Servers, Email protocols –SMTP, POP3, IMAp4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.	1
6.	Current Trends on Internet Languages, Internet Phone, Internet Video, collaborative computing, e- commerce. Web Publishing and Browsing 10 Hrs. Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools	1
7.	HTML Programming Basics HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia, Interactivity Tools 08 Hrs. 33 ASP, VB Script, JAVA Script, JAVA and Front Page, Flash	1
8.	Internet Security Management Concepts Information Privacy and Copyright Issues, Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptosystems.	1
	Text Books	
1. Greenl	aw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McG	rawHill,2007.
2 Ivan 1	Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Public	cations.
3. D. Con	ner, "The Internet Book", Pearson Education, 2009.	
	References	
1. M. L. Y	Young,"The Complete reference to Internet", Tata McGraw Hill, 2007.	
2. Godbo	le AS & Kahate A, "Web Technologies", Tata McGrawHill,2008.	
	n, "Web Technologies", Pearson Education, 2008. 4. B. Patel & Lal B. Bari	ik, " Internet &

Department of Computer Science & Engineering					
	National Institute of	Technology Srinagar	•		
Course Title	RDBMS	Semester	MTech		
Department	partment Computer Science & Course Code CST502				
_	Engineering				
Credits	03	L	Т	Р	
Course Type	Theory	2	0 2		
	Course O	bjectives			
1. Understand functional components of the DBMS.					
2. Devise queries using Relational Algebra, Relational Calculus and SQL.					
3. Develop E-R model and design database schema					

4. Understand transaction processing, concurrency control and recovery techniques.

Learning Outcomes

The student should develop skills and understanding in:

- the design methodology for databases and verifying their structural correctness
- implementing databases and applications software primarily in the relational model
- applying the theory behind various database models and query languages
- implementing security and integrity policies relating to databases

Course Synopsis

The **course** emphasizes the understanding of the fundamentals of relational systems including data models, database architectures, and database manipulations.

Course Outline / Content						
Unit	t Topics					
1.	Introduction to databases : What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management,	1				
2.	Data models : The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.	1				
3.	Database design and ER Model : overview, ER-Model,	1				
	Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas,					
4.	Relational database model : Logical view of data, keys, integrity rules. Relational Database design: features of good					
	relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).	2				
5	Relational Algebra and calculus : Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.	2				
6	Constraints, Views and SQL : What is constraints, types of constraints, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views SQL: data definition, aggregate	1				

	for the Null Value and a set of second state		
	function, Null Values, nested sub queries, Joined relations.		
	Triggers.		
7	Transaction management and Concurrency control:	2	
	Transaction management: ACID properties, serializability and		
	concurrency control, Lock based concurrency control (2PL,		
	Deadlocks), Time stamping methods, optimistic methods,		
	database recovery management.		
Text Books			
1.	Elamsri, Navathe, Somayajulu and Gupta, Fundamentals of Database Systems, 6th		
	Edition, Pearson Education, 2011.		
2.			
	Rob, Coronel, "Database Systems", Seventh Edition, Cengage Lea	rning.	
	References		
2.	A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", fifth		
	Edition McGraw-Hill,		

National Institute of Technology Srinagar

Hazratbal, Srinagar, Kashmir, 190006 India.



8th Semester

Computer Science & Engineering

Department of Computer Science & Engineering National Institute of Technology Srinagar					
Course Title	Project	Semester	8^{th}	8 th	
Department	Computer Science & Engineering	Course Code	e CSP460	CSP460	
Credits	12	L	Т	Р	
Course Type	Practical	0	0	12	

Course Objectives

The aim of the Final Year Project is to enhance the student's knowledge and skills in solving problem through structured project research in order to produce a competent and productive engineer.

Learning Outcomes

Upon completion of Final Year Project, student should be able to:

- Identify and describe the problem and scope of project clearly.
- Collect, analyze and present data into meaningful information using relevant tools.
- Select, plan and execute a proper methodology in problem solving.
- Work independently and ethically.
- Present the results in written and oral format effectively
- Identify basic entrepreneurship skills in project management

Course Synopsis

Final Year Project (FYP) is the individual project, which takes place over the two semesters. It is a mandatory subject for students to be awarded with Bachelor Degree. In the FYP, students are expected to undergo research studies which relate to the major course offered in the faculty.

The final year project consists of two parts; the first part FYP 1 is a prerequisite to the second part, FYP 2.

These two parts of FYP are under subject code CSE-705 and CSE-801 respectively.

Project Report Structure

The project group should spend enough time to prepare the report. It deals with all major issues that should be taken in to account in the report. In a report, not only there is a need of having proper structures but also it should speak about the format of the text processing. It has several sections. In the first section, it deals with the some initial pages such as Title Page, Declaration, Certificate, Acknowledgement, and Table of Contents.

In Section 2 the way one can write Abstract of the report has been explained.

Section 3 discusses the expectation of a reader in the first chapter of the report known as Introduction.

Next section is used to discuss the expected contents of the middle chapters of the report. Generally there are at least three middle chapters in the report such as Methodology, Results and Discussion.

Last chapter of the report discusses Conclusion and Future Work. Its format and expectation is given in Section 5.

Next section deal with the situation when one has to add Appendices in the project report. Last section explains the way one should write the references that are used in writing the report.

1. Preliminary Pages

This section discusses the need of having preliminary pages along with their need. Preliminary pages are Title Page, Certificate, Declaration, Acknowledgement, Table of Contents.

a) In **Title Page** author must mention Title of the report along with name of project group, supervisor, Department, Month and Year of submission. An effort should be made so that the

Title of the report consists of minimum number words but also it can give enough meaning on the work studied in the report. The desired format of the Title Page is enclosed in Appendix. The project group is advised to check it carefully.

b) The draft copy of the project report has to be submitted to the supervisor for the review. Based on the comments given by him, the project group should modify the report and include a **certificate** signed by the supervisor. The certificate should mention that the work has been carried out by this project group and has not been submitted by any other group of the institute for the award of any other degree. The format of the certificate is given in the Specimen Format of the report.

c) The project report must also contain a **declaration** from the project group to avoid the problem of plagiarism. Format of the certificate is given in the Specimen Format of the report. It is expected that the project group has submitted the results of their own thought, research, or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or whatever. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone.

When a student's assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain.

Plagiarism is a serious academic offense. Students occasionally plagiarize unknowingly, but this ignorance of the definition of plagiarism is not an excuse and does not prevent a penalty from being applied.

d) Most thesis authors put in a page of thanks, known as **Acknowledgements**, to those who have helped them in matters scientific, and also indirectly by providing such essentials as food, education, genes, money, help, advice, friendship etc. If any work is collaborative, one should make it quite clear who did which sections. Author should not forget to acknowledge if he has obtained any financial support from the Department or any other source to pursue this work. Format is enclosed.

e) **Table of Contents** provides the list of all headings and subheadings with page numbers. Subheadings are properly indented. It also provides list of all Tables, Figures and Symbols used in the report along with their respective page numbers. A general format is given in the Specimen Format of the report.

2. Abstract

An **abstract** is an abbreviated version of the project report. It should be limited to a maximum of 250 words. The project abstract appears at the beginning of the report. Almost all scientists and engineers agree that an abstract should have the following five pieces such as Introduction, Problem Statement, Procedure, Results and Conclusion. In Introduction, one describes the purpose for doing such a project. It should address the need for such type of work. It should explain something that should cause people to change the way they go about their daily business. If the project leads to an invention or development of a new procedure, it should mention its advantages. Abstract should be such that it motivates the reader to read the entire paper or display board. In the next stage, one should write down the Problem Statement. It is needed to identify the problem that has been considered in the project. In Procedures, the approach used to investigate the problem should be mentioned in the abstract. However it is expected that one will not go into detail about materials unless they were critical to the success. However one should try to describe the most important variables used in the report if room permits. In the fourth stage, abstract must clearly state the Results/ achievements obtained through the execution of the project. Finally Conclusions are given an the last stage. One should state clearly whether the objectives have been met or not. If not, the reasons behind it should be stated in few words.

In writing the abstract, one should avoid the following things:

- Any technical term that most readers do not understand should be avoided.
- Any abbreviation or acronym that is not commonly used should be avoided.
- Abstracts should not contain a bibliography or citations.
- Abstracts should not contain any tables or graphs.
- Abstracts must give only minimal reference to any earlier work.
- Abstract should only include procedures done by the group.
- One should not put acknowledgements in the abstract.

2.2.1 Importance of Abstract

Abstract helps people quickly to determine if they want to read the entire report. Consequently, at least ten times as many people will read an abstract as any other part of the total work. It's like an advertisement of the work done. If one wants judges and the public to be excited about the project, then he must write an exciting, engaging abstract.

Since an abstract is so short, each section is usually only one or two sentences long. Consequently, every word is important to conveying the message. If a word is boring or vague, one should refer to a thesaurus and find a better one. If a word is not adding something important, one should not use it. But, even with the abstract's brief length, one should not be afraid to reinforce a key point by stating it in more than one way or referring to it in more than one section.

2.2.2 Meeting the Word Limit

Most authors agree that it is harder to write a short description of something than a long one. One can use the following tip. For the first draft, one should not be overly concerned about the length. Just he should make sure that the draft abstract has considered all the key information. Then one can cross out words, phrases, and sentences that are less important than others. In the next stage one can look for places where sentences can be combined so that the total length can be reduced. After a short break, one should again read the draft to give the final shape of the abstract. With a fresh eye, one will probably find new places to cut and will be able to make the abstract.

3. Introduction

It is the first chapter of the Report. The purpose of an introduction in the B. Tech Project

Report is to justify the reasons for writing about the report. The goal in this section is to introduce the topic to the reader, provide an overview of previous research on the topic, and identify the own hypothesis. The goals just mentioned could, if abused, lead to write an introduction that is pages and pages long. It can be noted here that the introduction should not contain every bit of detail in the report, and it should not include support for the report. An introduction might, however, include the reasons for supporting the report.

In order for readers to trust the writer, the introduction must be well written with few errors. In order to keep readers reading, the writer needs to catch the attention of the reader and write in an interesting way. The unique language enhancement feature may suggest words to strengthen the writing. Strong writing may hold readers' attention.

In addition to well-written English with strong vocabulary, there are a few other strategies to hold readers' attention. It should be noted that to excite the readers' interest, one may also want to sound as though the readers know the topic that are considered in the report. Some of the following strategies in the bullet-list above may help.

- To pose a specific question that can invite the readers to keep reading for the answer--A provocative question works well to engage readers, so long as it doesn't put them off.
- To choose statistics to surprise readers or to go against the common belief about a topic.
- To mention a short, interesting anecdote (or story) related to the topic.
- To provide an interesting (and relevant) quote.
- To develop an unusual or unexpected comparison.

It has been observed that the difficulty level to write the Introduction is average and it takes the variable amount of time. Generally, it consists of the five major tasks and they are

- Problem introduction
- Previous work carried out in this field.
- Researching the problem studied.
- Summarization of the results obtained.
- Organization of the report.

3.1 Introduction of the Problem

This is the first task which provides a brief description of the research question. It speaks about the type of the experiment or study attempting to demonstrate or the phenomena that are planned to study. It also should provide a brief history of the problem and explain how it is important to make such type of study.

3.2 Summarize Previous Research

The second task of the Introduction is to provide a well-rounded summary of previous research that is relevant to the problem considered for the study. So, before one begins to write this summary, it is important to thoroughly research the problem. Finding appropriate sources amid thousands of journal articles can be a daunting task, but there are a number of steps that one can take to simplify the work which has been carried out.

3.3 Researching the Problem

One should search a journal database to find articles on the considered subject. Once an article is found, it is suggested to look at the reference section to locate other studies cited in the article. While taking notes from these articles, one should be sure to write down all the

desired information. A simple note detailing the author's name, journal, and date of publication can help to keep track of sources and to avoid plagiarism.

3.4 Provide the Hypothesis

Once the previous research work has been summarized, it is expected that a subsection is to be written to explain areas where the research work is lacking or potentially flawed. It should also mention the missing or unrevealed components from previous studies on the considered problem. As a result, the derived hypothesis should lead from these questions. At the end of the Introduction, one should clearly state the hypothesis and describe the expectation that one wants to achieve through the experiment or study.

3.5 Organization of the Report

This is the last task in this section. One should write clearly the organization of the project. It provides the short description of the work reported in each chapter.

3.6 Other Issues

Types of introductions that should be avoided are given below.

3.6.1 The Dictionary Definition

Many papers begin with defining words through the dictionary meaning and then continue to discuss the topic. This type of introduction has become very stale with faculty, who have seen it thousands of times.

3.6.2 Cutting to the Chase too Quickly

It is too easy to go too far while avoiding overly general introductions. Avoid jumping right into a thesis statement and do not try to cover every topic in the first paragraph. It is difficult to say how specific to be in an introduction, but consider the idea that this part of a paper provides "the lay of the land" for a reader who can then know *why* the paper is worth finishing.

3.6.3 Memorable Quotations

Some readers do not like papers to start with another's words. This overused strategy may be acceptable if a direct quotation sets the stage for what follows and its relevance is discussed in the introduction.

3.6.4 The "telegraphic" sentence

Here a writer uses the first or second or third person to tell a reader what is going to happen. This should be avoided as far as possible. One can use passive voice to avoid such type of situation.

3.6.5 Use of Tense

Very often, it has been seen that author mixes up various tenses to express. It is expected that one uses only present tense through the report.

3.7 Purpose of Introduction

Thus an introduction serves two purposes:

- It gives readers an idea of what the rest of the writing will say.
- It provides a reason for readers to keep reading.

The first reason is the most important. Some methods for letting readers know include:

- A clear and specific thesis statement (see How to Write a Thesis Statement).
- Providing background or history for the topic.
- Defining a term, phrase, or concept central to the writing.
- Providing statistics

Here is a writing tip for Introduction. One should not write Introduction until draft of the report has been revised and finalized. That way, one can have a better idea of what the work actually says, instead of what one can think what it will say.

4. Middle Chapters

In some theses, the middle chapters are the articles of which the student group is the major author. There are several disadvantages to this format. One is that a report is both allowed and expected to have more detail than a journal article. For journal articles, one usually has to reduce the number of figures. In many cases, all of the interesting and relevant data can go in the project report, and not just those which appeared in the journal. The degree of experimental detail is usually greater in a project report. Relatively often a researcher requests a report in order to obtain more detail about how a study was performed.

Another disadvantage is that the journal articles may have some common material in the introduction and the "Materials and Methods" sections.

4.1 Structure of Report

The exact structure in the middle chapters may vary among theses. In some reports, it is necessary to establish some theory, to describe the experimental techniques, then to report what has been done on several different problems or different stages of the problem, and then finally to present a model or a new theory based on the new work. For such a report, the chapter headings might be: Theory, Materials and Methods, {first problem}, {second problem}, {third problem}, {proposed theory/model} and then the conclusion chapter. For other reports, it might be appropriate to discuss different techniques in different chapters, rather than to have a single Materials and Methods chapter.

Following are the some comments on the elements Materials and Methods, Theory, Results and Discussion which may or may not correspond to thesis chapters.

4.2 Materials and Methods

This varies enormously from project report to report, and may be absent in theoretical reports. It should be possible for a competent researcher to reproduce exactly what author has done by following the description. There is a good chance that this test can be applied: sometime after the author has left the institution, another researcher may like to do a similar type of experiment either with author's help, or on a new set-up in a different institute. Author should write clearly this chapter for the benefit of that researcher.

In some reports, particularly multi-disciplinary or developmental ones, there may be more than one such chapter. In this case, the different disciplines should be indicated in the chapter titles.

4.3 Theory

When author is reporting theoretical work that is not original, he should include sufficient material to allow the reader to understand the arguments used and their physical bases. Sometimes he may be able to present the theory *ab initio*, but he should not reproduce two pages of algebra that the reader could find in a standard text. One should not include theory which is not related to the work done.

When writing this section, author should concentrate at least as much on the physical arguments as on the equations. He should try to explain the meaning of each equation and provide sufficient explanation on the important ones.

When author is reporting his own theoretical work, he must include rather more detail, but he should consider moving lengthy derivations to appendices. He should think too about the order and style of presentation: the order in which he has done the work may not be the clearest presentation.

Suspense is not necessary in reporting science. Author should tell the reader where he is going before he starts. The following are the expectation from this chapter:

- Information to allow the reader to assess the believability of the results.
- Information needed by another researcher to replicate the experiment.
- Description of the materials, procedure, theory.
- Calculations, technique, procedure, equipment, and calibration plots.
- Limitations, assumptions, and range of validity.

It should also carefully see the following issues:

- One should be able to replicate the study accurately (for example, all of the optional and adjustable parameters on any sensors or instruments that were used to acquire the data).
- Another researcher should be able to find accurately and reoccupy the sampling stations or track lines.
- There should be enough information provided about any instruments used so that a functionally equivalent instrument could be used to repeat the experiment.
- If the data is in the public domain, another researcher should be able to lay his or her hands on the identical data set.
- One should be able to replicate any laboratory analyses that have been used.
- One should be able to replicate any statistical analyses.
- Another researcher should be able to approximately replicate the key algorithms of any computer software.

Citations in this section should be limited to data sources and references of where to find more complete descriptions of procedures. Results are not to be discussed in this chapter.

4.4 Results and Discussion

The results and discussion are very often combined in reports. This is sensible because of the length of a report: one may have several chapters of results and, if one waits till they are all presented before he begins discussion, the reader may have difficulty remembering what he is talking about. The division of Results and Discussion material into chapters is usually best done according to subject matter.

One must ensure that he has described the conditions which obtained for each set of results. The report must explain clearly the way of obtaining the constant, other relevant parameters. He should be sure too that he has used appropriate statistical analyses. Where applicable, he Has shown measurement errors and standard errors on the graphs. It is expected that appropriate statistical tests have been used in the work.

4.4.1 Graph Plotting

Author should take sufficient care to plot graphs. The origin and intercepts are often important so, unless the ranges of data make it impractical, the zeros of one or both scales should usually appear on the graph. One should show error bars on the data, unless the errors are very small. For single measurements, the bars should be the best estimate of the experimental errors in each coordinate. For multiple measurements these should include the standard error in the data. The errors in different data are often different, so, where this is the case, regressions and fits should be weighted (i.e. they should minimize the sum of squares of the differences weighted inversely as the size of the errors.) A common failing in many simple software packages that draw graphs and do regressions is that they do not treat errors adequately. Author can just 'paste' data into the input and it generates a .ps file of the graph. In most cases, each result needs discussion. Meaning of each result has to be explained. It should be explained clearly how they fit into the existing body of knowledge. Consistency of results is to be seen. Results should give new insights. If possible, it should suggest new theories or mechanisms. Some salient points which should be taken care are given below.

- The results are actual statements of observations, including statistics, tables and graphs.
- Actual information on range of variation.
- Discussion of both negative results as well as positive. Not to interpret results at this stage.
- Availability of sufficient details of results so that others can draw their own inferences and construct their own explanations.
- Use of S.I. units (m, s, kg, W, etc.) throughout the report.
- Breaking up of results into logical segments by using subheads

The author must make it crystal clear to the reader which statements are observation and which are interpretation. In order to achieve this, it is suggested to have two different chapters- one for results and other for discussion. Overlay interpretation on top of data in Figures should be avoided.

4.5 Discussion

Author can start with a few sentences that summarize the most important results. The discussion section should be a brief essay in itself, addressing the following issues:

- The major patterns in the observations that can be referred as spatial and temporal variations.
- The relationships, trends and generalizations among the results.
- Expectations to these patterns or generalizations, if any.
- Likely causes (mechanisms) underlying these patterns resulting predictions.
- Agreement or disagreement with previous work.
- Interpretation of results in terms of background laid out in the introduction the relationship of the present results to the original problem.
- Implication of the present results for other unanswered problems.
- Multiple hypotheses: There are usually several possible explanations for results. One should be careful to consider all of these rather than simply pushing the favorite one. If one can eliminate all but one, that is great, but often that is not possible with the data in hand. In that case one should give even treatment to the remaining possibilities, and try to indicate ways in which future work may lead to the discrimination.
- Avoiding bandwagons: A special case of the above. It is suggested to avoid jumping a currently fashionable point of view unless the results really do strongly support them.
- Things that are known or understood after reading the report.
- Inclusion of the evidence or line of reasoning supporting each interpretation.
- Significance of the present results.

This section should be rich in references to similar work and background needed to interpret results. However, interpretation/discussion section(s) are often too long and verbose. There may be some material that does not contribute to one of the elements listed above. In that case, this may be material that one may like to consider deleting or moving. It is suggested to break up the chapter into logical segments by using subheads.

4.6 Conclusions and Further Work

This is the last chapter of the project report. Abstract of the report should include conclusions in very brief form, because it must also include some other material. A summary of conclusions is usually longer than the final section of the abstract, and author has the space to be more explicit and more careful with qualifications. He might find it helpful to put the conclusions in point form.

It is often the case with scientific investigations that more questions than answers are produced. It must indicate whether the work carried out suggests any interesting further avenues. It should discuss the possibility of improving the work by future workers. A paragraph should be written on the practical implications of the work.

This chapter should usually be reasonably short---a few pages perhaps. As with the introduction, it is a good idea to ask someone who is not a specialist to read this section and to comment.

4.7 Appendices

If there is material that should be in the project report but which would break up the flow or bore the reader unbearably, include it as an appendix. Some things which are typically included in appendices are: important and original computer programs, data files that are too large to be represented simply in the results chapters, pictures or diagrams of results which are not important enough to keep in the main text. Thus in the appendix, one should include

- all data used in the report
- reference data/materials not easily available
- tables (where more than 1-2 pages)
- calculations (where more than 1-2 pages)
- all key articles
- list of all additional resource materials
- list of equipment used for an experiment or details of complicated procedures.

4.8 References

It is tempting to omit the titles of the articles cited, and the university allows this, but thinks of all the times when author has seen a reference in a paper and gone to look it up only to find that it was not helpful after all. If he cites a journal article or book, the reader can go to a library and check that the cited document and check whether or not it says what he says it did. A web site may disappear, and it may have been updated or changed completely. So references to the web are usually less satisfactory. Nevertheless, there are some very useful and authoritative sources. However it is expected that such citations should not be overused. In particular, a web citation should not be used if there exists a "hard" citation. Author should give the exact URL. Thumb rules followed to refer some one's work are given below.

• cite all ideas, concepts, text, data that are not own by the project group

- if author makes a statement, he must back it up with his own data or a reference
- all references cited in the text must be listed
- list all references cited in the text in alphabetical

	Department of Computer National Institute of T	0	U	
Course Title	Practical Training & Tour	Semester	8 th	
Department	Computer Science &	Course Code	CSI461	
1	Engineering			
Credits	01	L	Т	Р
Course Type	Lab	0	0	2
	Course Ob	ojectives		L
aimed at the prof	g - is defined as an integrative han ressional preparation and training of nization in which they work. Practic	f a student. Students	should be expo	osed to variou
to all parts of the	e curriculum. The student always v	works with the suppo	rt and appropr	iate help fror
-	tor. However, the student is enga			-
responsibility is t	-		•	·
Field courses (p	ractical trainings) take place away	from the College, us	ually at an ind	ustry, researc
institution or any	• • •	C A	-	·
	Learning C	Dutcomes		
The overall goa	l of the practical training is:			
-	he field experience, to deepen pr	rofessional educatio	on,	
-	g the theory to life (apply the know			real workin
environi	ment)			
• To prov	ide students with practice experie	ence out of college,	in organizati	onal setting.
• To gain	additional insight into the realist	ic work situations		
• To apply	y knowledge and skill in practice	>		
-	rate classroom experience with v	-		
• To incre	ease the student's professional se	lf-awareness		
-	practical work experience			
	plement the knowledge and skills			
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	t / carry out real tasks and duties	8		
	career guidance to the students			
	v students to participate in practi	cal lab work, meeti	ngs, conferen	ces, training
	learning opportunities			
	rience responsible interaction wi	th professionals		
• To get for	eedback from field to class.			

National Institute of Technology Srinagar



Detailed Syllabus Electives

Computer Science & Engineering

		Department of Computer National Institute of T	-	-	
Course	Title	Simulation and Modelling	Semester		
Departi		Computer Science &	Course Code	CST001	
Departi	ment	Engineering	Course Coue	CD1001	
Credits		03	L	Т	Р
Course		Theory	3	0	0
course	1,100	Course Ol	-		Ŭ
The obj	ectives	of this course are to:			
•		ce students to the simulation and	modelling techniques	S	
		students with opportunities to d			odelling skil
		spect to carrying out research p	1		0
	compute				
-	<u> </u>	Learning (Dutcomes		
After the	e course	e the student should be able to			
• I	Define l	pasic concepts in modelling and s	simulation		
		various simulation models and g		es for each	categorv
	-	ct a model for a given set of data			0,
		e output data produced by a mode			
		Course S			
In this				1 ' 1	
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		students study the representation matical formulations. Case studie			
range of	mathe	matical formulations. Case studie	es are used to illustra	te a variety	of modellin
range of techniqu	mather	matical formulations. Case studie e students learn to develop typi	es are used to illustra cal mathematical mo	te a variety dels and u	of modellin
range of techniqu	mather	matical formulations. Case studie	es are used to illustra cal mathematical mo engineering systems.	te a variety dels and u	of modellin
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1.	A. C. Fowler, Mathematical Models in Applied Sciences, Cambridge University
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2.	S.M. Ross, Simulation, India Elsevier Publication

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5.	Directed Graphs: Types of digraphs, Euler Digraphs, Trees	
	with directed edges, Matrix representation of digraphs,	2
	Tournaments, Acyclic digraphs and decyclization.	
6.	Graph theoretic Algorithms: Shortest path algorithms,	2
	Dijkstra's algorithm, Warshall - Floyd algorithm, Depth-First	
	search in a graph, Breadth – first search in a graph.	
	Text Books	
1.	NarsinghDeo, Graph Theory with Applications to Engineering	and Computer
	Science, PHI.	
2.	R.J. Wilson, Introduction to Graph Theory, Fourth Edition, Pearson	Education, 2003
	References	
1.	Douglas B. West, "Introduction to Graph Theory", Prentice Hall of	India, 2005
2.	S.Even. Graph Algorithms, Computer Science Press, 1979	

Department of Computer Science & Engineering							
	National Institute of Technology Srinagar						
Course Title Digital Signal Processing Semester							
Department	Department Computer Science & Course Code CST003						
	Engineering						
Credits	03	L	Т	Р			
Course Type							
	Course Objec	ctives					

This course includes:

- To develop methods for processing discrete-time signals.
- To understand the processes of A-D and D-A conversion.
- To acquire some familiarity with digital filters in terms design and implementation and to become familiar with how various types of filters affect signal characteristics.
- To understand the discrete Fourier transform and discrete spectral analysis.
- To become familiar with some applications of digital processing.

Learning Outcomes

After completion of course students will be able to:

- Be able to perform FIR AND IIR filters by hand to meet specific magnitude and phase requirements.
- Perform Fourier transform and inverse Fourier transform using definitions, tables of standard transforms and properties.
- Design and implement digital filters by hand and by using Matlab.
- Use computers and Matlab to create, analyse and process signal and to simulate and analyse systems sound and image synthesis and analysis.

Course Synopsis

Digital Signal Processing discusses analysis and representation of discrete-time signal systems, including discrete-time convolution, difference equations, the z-transform, and the discrete-time Fourier transform. The course proceeds to cover digital network and non recursive (finite impulse response) digital filters. Digital Signal Processing focuses on digital filter design and a discussion of the fast Fourier transform algorithm for computation of the discrete Fourier transform.

Course Outline / Content					
Unit	Topics	Week			
1.	Discrete Time Signals And Systems : Representation of discrete time signal – classifications – Discrete time – system – Basic operations on sequence – linear – Time invariant – causal – stable – solution to difference equation – convolution sum – correlation – Discrete time Fourier series – Discrete time Fourier transform	2			
2.	transform. Fourier And Structure Realization: Discrete Fourier transform – properties – Fast Fourier transform – Z-transform – structure realization – Direct form – lattice structure for FIR filter – Lattice structure for IIR Filter.	3			
3.	Filters: FIR Filter – windowing technique – optimum equiripple linear phase FIR filter – IIR filter – Bilinear transformation				

		-
	technique – impulse invariance method – Butterworth filter – Tchebycheff filter.	3
4.	Multistage Representation: Sampling of band pass signal – anti aliasing filter – Decimation by an integer factor – interpolation	
	by an integer factor – sampling rate conversion – implementation of digital filter banks – sub-band coding – Quadrature mirror filter – A/D conversion – Quantization – coding – D/A conversion – Introduction to wavelets.	3
5.	Digital Signal Processors: Fundamentals of fixed point DSP architecture – Fixed point number representation and computation – Fundamentals of floating point DSP architecture – floating point number representation and computation – study of TMS 320 C 54XX processor – Basic programming – addition – subtraction – multiplication – convolution – correlation – study of TMS 320 F2XXX processor – Basic programming – convolution – correlation.	3
	Text Books	
1.	John G. Proakis, Dimitris, G. Manolakis, "Digital Signal Proce Algorithms and Applications", PHI.	ssing: Principles,
2.	S.Salivahanan, A.Vallavaraj and C.Gnanapriya, "Digital Signal Pr 2000.	rocessing", TMH,
3.	A.V. Oppenheim and R.W.Schafer, Englewood, "Digital Sig Prentice-Hall Inc, 1975. 4.	nal Processing",
1.	B.Venkatramani&M.Bhaskar, "Digital Signal Processor programming and applications",TMH, 2002.	s architecture,
	References	
1.	Rabiner L.R and C.B Gold,"Theory and Applications of Digital Si Prentice Hall of India, 1987.	gnal Processing",
2.	Leudeman L.C, "Fundamentals of Digital signal processing", Publication, 1986.	Harper & Row

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6.	Multimedia Information Systems: Operating system support for continuous media applications, limitations of OS, new OS support, media stream protocol, file system support for continuous media, data models for multimedia and hypermedia information, content based Retrieval of unstructured data.	3
	Text Books	
1.	Li, Z.N. and Drew, M.S., "Fundamentals of Multimedia", Pearson	Education.
2.	Hillman, D., "Multimedia Technology and Application", Galgotia	Publication.
	References	
1.	Steinmetz, R., "Multimedia Computing, Communication and	l Applications",
	Pearson Education.	
2.	Buford, J., "Multimedia Systems", Addison Wesley.	

		Department of Con	-	-	-		
~		National Institu			ar		
Course Ti		Logic Programming.		emester			
Departme		Computer Science &	C	ourse Cod	e CST	005	
		Engineering					
Credits		03		L	Т	Р	
Course Ty	ype [Theory		3	0	0	
			urse Objective				
• To	develop	an understanding of	basic knowled	lge and pra	ictical exp	perience in lo	gi
pro	ogrammin	ıg.					
• To	learn abo	out the formal concep	ts used as a the	oretical bas	is for logic	c programmin	g.
• To	interpret	problems in a style th	nat suits logic p	rogrammin	g		
• To	understa	and principles of dec	larative specifi	cation, and	its relation	on to procedu	ra
	lisations.		•			•	
		Lea	rning Outcome	es			
Upon com	pletion of	f this course, students			owing:		
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		and efficiency.	a given simple	logic prog	,iuiii. ine		01
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	0 0 1	v logic programming	differs from oth	er program	ming nara	diams	
• LA	piani nov		ourse Synopsis		ining para	urgins.	
Formulatio	on of neo	blems using Proposit	v 1		1 deductio	Duon antion	
		; Fundamentals of Pr					
		Programming in Pro					
Evaluation	-		Jog, Meta le	ver program	immig, L	azy and La	30
Evaluation	i Strategi		Qutling / Com	tont			
TI:4			e Outline / Con	lieni		Weels	
Unit	D		Copics			Week	
	-	tion Logic: Introdu	U	io and f			
		, managitional ag	acomto comoni			2	
	coluing v	n, propositional con	ncepts, seman			2	
	`	with semantic table.	-	tic table,	problem	2	
2.	Natural	with semantic table. Deduction and Axio	omatic Proposi	tic table, tional Log	problem ic: Rules		
2.	Natural of natura	vith semantic table. Deduction and Axio al deduction, sequent	omatic Proposi calculus, axior	tic table, tional Log natic syster	problem ic: Rules ns, Meta	2	
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2. 3.	Natural of natura theorems resolutio Introduc	with semantic table. Deduction and Axio al deduction, sequent s. Important proper n, resolving argument ction to Predicate	matic Proposi calculus, axion ties of AL (ts. Logic: Objec	tic table, tional Log natic syster (Axiomatic cts, predica	problem ic: Rules ns, Meta Logic), ates and	2	
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5.	Prolog Concepts: Programming in Prolog (overview), Meta level programming and Meta interpreters. Nondeterministic programming, incomplete data structure, second order programming in Prolog. Logic grammars: definite clause grammar, A grammar interpreter.	2
6.	Lazy and Eager Evaluation Strategies: Evaluation strategies, Lazy evaluation: evaluation order and strictness of function, programming with lazy evaluation, interactive functional program, delay of unnecessary computation, infinite data structure, eager evaluation and reasoning.	3
	Text Books	
1.	John Kelly, "The Essence of Logic", Prentice-Hall India.	
2.	SarojKaushik, "Logic and Prolog Programming", New Age Interna	ational ltd
3.	TasamiHagiya and Philip waddle, "Functional and Logic Pro Edition, 2006.	gramming, 8th
	References	
1.	TestsuoIda,Atsushiohori and Masato Takichi, "Functiona Programming", 2006.	al and Logic
2.	Chang, C.L and Lee R.C .T, "Symbolic Logic and Mechanical th Academic Press, New York, 2006.	eorem proving",
3.	J.W. Lloyed, Springer Verlog, "Foundation of logic programmi 2/E, 1987.	ng", New York,

		Department of Computer		-	
Carrie	T: 41a	National Institute of 7		ar	
Course	1 itie	Embedded Systems	Semester		
Departi	nent	Computer Science &	Course Code	CST	006
2 opui 0		Engineering		0.51	
Credits		03	L	Т	Р
Course		Theory	3	0	0
	J I	Course O	bjectives		
Microco Architeo	ontroller cture, A	nis course to provide the sta s and Embedded systems. T ssembly Language Programmir niques of 8051 Microcontroller.	The course covers ng, Instruction set, S	fundamen	ntals, The 805
		Learning	Outcomes		
H • H H • H	peripher Foster al Foster al	bility to understand the inter al devices with Microcontroller bility to write the programs for a bility to understand the role of e	s. microcontroller. embedded systems ir	n industry.	
• 1	-oster a	oility to understand the design c	concept of embedded	avetome	
Assemb	ly Lar	Course S real time systems, The 805 iguage Programming, Instru	Synopsis 1 Architecture, Me action set, 8051	emory org	
Assemb Microco	ly Lar	real time systems, The 805 nguage Programming, Instru Interfacing, Basic concept of P Course Outli	Synopsis 1 Architecture, Me action set, 8051 IC microcontroller.	emory org	ganization, 805 Communication
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Assemb Microco	ly Lan ontroller Intro Embe Embe bit, s Micro	real time systems, The 805 nguage Programming, Instru Interfacing, Basic concept of P Course Outli Topics duction: Concept of Real tin dded System Design. Introduct dded Processors, Microcontrol ixteen bit, thirty two bit M processors and Microcontrol	Synopsis 1 Architecture, Me action set, 8051 21C microcontroller. ane / Content ne Systems, Challe tion to Microcontrol llers survey, four b licrocontrollers, Co	emory org Serial enges in llers and bit, eight mparing	ganization, 805 Communication
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7.	Microcontroller Interfacing: Key Board, Displays, Pulse	2
	Measurement, D / A and A/D conversion, Stepper Motor-	
8.	Basic concept of PIC microcontroller: Microcontroller	1
	Architecture, PIC16F.	
	Text Books	
1.	The 8051 Microcontrollers and Embedded Systems : Muhammed A	Ali Mazidi
2.	The 8051 Microcontrollers Architecture, Programming & Applicat	ions Kenneth J.
	Ayala.	
	References	
1.	Design with PIC Microcontroller: John Petman	

		Department of Computer Science National Institute of Technol	8 8		
Cours	e Title	National Institute of Technol Advanced Java and Android Programming	Semester		
Depar	tment	Computer Science & Engineering	Course Code	CST	007
Credit		03	L	T	<u> </u>
	e Type	Theory	3	0	0
Cours	e rype	Course Objective	-	0	0
apps to		pps from scratch using Android Studi Play and reach Millions of Android u	o and Java Program		
·	-	Learning Outcom	nes		
• • •	Use the Ja Use the de Describe t Utilize Se location to	completion of this class, student will be two programming language to build An evelopment tools in the Android devel the life cycles of Activities, Application ensors like Gyroscopes, Accelerome to their apps	ndroid apps opment environmer ons and Fragments ters and GPS to a		on an
•		receive SMS messages programmatic		a .	
•	Package a	nd prepare their apps for distribution		Store.	
		Course Synopsis			
Collect	tion Interfa	ces; Multithreading; Networking; Jav		ctivity (JDE	BC).
		Course Outline / Co	ntent		
Unit		Topics			Weel
1.	Framewor Multithreacting or	ns : Collection Interfaces, Concrete rk eading: Creating thread and run n single object, Synchronization, The rread priorities, Daemon Thread, Life	nning it, Multiple hread communication	e Thread	2
2.	, Factory Connection Enterpris JavaBean	ing: Addressing, Methods, Instance Methods, TCP/IP (on, TCP/IP Server Sockets, Datagram, se Java Bean: Preparing a Class to , JavaBean Properties, Types of b Session bean, Entity bean.	o be a JavaBean, (Creating a	3
3.	Java Dat Joining, M Transactio Servlets: Servlet L Requests,	abase Connectivity (JDBC): Mergin	DBC, Prepared S e, Interface Servle quests, Handling H	Statements, t and the TTP post	3
4.	User Inte	on Smart Phone Application Develo erface Architecture, Activities and and Alerts, User Interface layout	Intents, Threads, ts, user interface of	Services, events, UI	3
5.	Widgets,	Notification and Toast, Menus, Dialog interface-Camera, Sensors, Telepl			

	and Content Providers. Network Communication, Services, Publishing your
	App.
	Text Books
1.	Core and Advanced Java, Black Book, Dreamtech Press
2.	Java SE8 for Programmers (3rd Edition) (Deitel Developer Series) by Paul
	Deitel and Harvey Deitel
3.	Head First Android Development, By Dawn Griffiths and David Griffiths,
	OReilly.
	References
1.	"Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S.
	E. Santry – Prentice Hall
2.	"Beginning Java [™] EE 6 Platform with GlassFish 3 From Novice to Professional" by
	Antonio Goncalves- Apress publication
3.	"Android Programming for Beginners", by John Horton.

	Department of Computer Sci National Institute of Tech	U	0	
Course Title	System on Chip	Semester		
Department	Computer Science &	Course Code	CST008	
	Engineering			
Credits	03	L	Т	Р
Course Type	Theory	3	0	0
	Course Objec	tives		
This course wil	provide an understanding of the co	ncepts, issues, a	nd process of	designing

This course will provide an understanding of the concepts, issues, and process of designing highly integrated SoCs following systematic hardware/software co-design & co-verification Principles using state of the art synthesis and verification tools and design flows.

Learning Outcomes

Upon completion of the course, the student shall be able to:

- Understand hardware, software, and interface synthesis with emphasis on issues in interface design.
- Describe examples of applications and systems developed using a co-design approach

Course Synopsis

The incessant drive of Moore's law has created an era where most electronic systems contain chips that integrate various (hitherto discrete) components such as microprocessor, DSPs, dedicated hardware processing engines, memories, and interfaces to I/O devices and off-chip storage. Most electronic systems today - cell phones, iPods, set-top boxes, digital TVs, automobiles - contain at least one such "System-on-chip". Designing System-on-chips is a highly complex process. Before entering the traditional VLSI implementation process (RTL, logic & physical design), design teams need to perform the challenging tasks of developing a functional specification, partitioning and mapping of functions onto hardware components and software, design of communication architecture to interconnect the components, functional/performance/power analysis and validation, and more. This course will present students with an insight into the earlier stages of the System-on-chip design process (what happens before you get down to RTL, gates, transistors, and wires). In addition to the conceptual foundations, this course will also involve significant hands-on assignments and/or a project that will give students an exposure to state-of-the-art design methodologies and platforms. This course is part of a proposed "Embedded Systems" curriculum that is currently being discussed by Purdue ECE and CS.

	Course Outline / Content	
Unit	Topics	Week
1.	Introduction: Architecture of the present-day SoC - Design issues of SoC- Hardware-Software Codesign – Core Libraries –	1
	EDA Tools.	
2.	Design Methodology for Logic Cores: SoC Design Flow – guidelines for design reuse – Design process for soft and firm cores – Design process for hard cores – System Integration.	2
3.	Design Methodology for Memory and Analog Cores: Embedded memories – design methodology for embedded memories – Specification of analog circuits – High speed circuits.	2
4.	Design Validation: Core-Level validation – Core Interface verification - SoC design validation.	1

5.	Core and SoC Design Examples : Microprocessor Cores – Core	
5.	Integration and On-chip bus – Examples of SoC.	2
6.		
0.	Configurable Processors: A Software View: Processor Hardware/Software Cogeneration, The Process of Instruction	2
	Definition and Application Tuning. The Basics of Instruction	2
	Extension d. The Programmer's Model .Processor Performance	
	Factors. Example: Tuning a Large Task, Memory-System Tuning	
	h. Long Instruction Words.	
7.	Configurable Processors: A Hardware View: Application	
	Acceleration: A Common Problem. Introduction to Pipelines and	
	Processors. Hardware Blocks to Processors d. Moving from	2
	Hardwired Engines to Processors. Designing the Processor	
	Interface. Novel Roles for Processors in Hardware Replacement,	
	Processors, Hardware Implementation, and Verification Flow	
8.	Advanced Topics in SOC Design: Pipelining for Processor	2
	Performance, Inside Processor Pipeline Stalls, Optimizing	
	Processors to Match Hardware d. Multiple Processor Debug and	
	Trace and Issues in Memory Systems.	
	Text Books	• • • • •
1.	RochitRajsuman, 'System-on-a-Chip: Design and Test', Artech Ho	
2.	Steve Furber, ARM System-on-Chip Architecture, 2nd ed,	Addison-Wesley
	Professional, 2000.	
3.	D. Black, J. Donovan, SystemC: From the Ground Up, Springer, 2	004.
	References	
1.	Ricardo Reis & Jochen A.G. Jess, 'Design of System on a C	Chip: Devices &
	Components', Kluwer, 2004.	
2.	Laung-Terng Wang, Charles E. Stroud, Nur A. Touba, 'Syst	em-on-Chip Test
	Architectures', Morgan Kaufmann, 2007	
3.	Harris, D.M. and Harris S. L., Digital Design and Computer Arch	nitecture, Morgan
	Kaufmann, 2007.	
4.	Pong P. Chu, RTL Hardware Design Using VHDL: Coding	g for Efficiency,
	Portability, and Scalability, John Wiley & Sons.	

	Department of Computer Sci National Institute of Tech	•	•	
Course Title	Advanced Internet Technologies	Semester		
Department	Computer Science &	Course Code	e CST009	
_	Engineering			
Credits	03	L	Т	Р
Course Type	Theory	3	0	0

Course Objectives

This course includes:

- To provide an in-depth understanding of selected Internet protocols
- To gain more advanced modelling, analysis and programming skills.
- To provide some breadth of understanding of selected computer networking topics.

Learning Outcomes

After completion of course students will be able to:

- Create sophisticated web applications for deployment to production.
- Describe the components that make up a web based application.
- Introduce security features to web applications.

Course Synopsis

The subject provides knowledge and skills in advanced internet technologies particularly related to server-side internet programming and business-to-business systems. It covers topics relevant to advanced internet programming including Web 2.0, HTML, XHTML, CSS, Javascript, Document object modelling, .NET, C#, etc..

	Course Outline / Content	
Unit	Topics	Week
1.	Introduction to the Internet: Brief overview of Internet, Internet and routing protocols, Web Server administration, Client Sever implementation, Cyber law, Search Engine Optimization	1
	Techniques, Web Based Systems.	
2.	Web 2.0: Search, content networks, user-generated content, blogging, social networking, social media, tagging, social bookmarking, rich Internet applications, web services, location- based services, Web 2.0 monetization and business models, future of the Web.	1
3.	Mark up Languages (HTML, XHTML): HTML, dynamic HTML, XHTML syntax, headings, linking, images, special characters and horizontal rules, lists, tables, forms, internal linking, Meta elements.	1
4.	Cascading Style Sheets (CSS): Separation of content and presentation, inline styles, embedded style sheets, conflicting styles, linking external style sheets, positioning elements, backgrounds, element dimensions, box model and text flow, media types, building a CSS drop-down menu, user style sheets.	2
5.	JavaScript: Client side scripting, control statements, functions, arrays, objects, events.	1
6.	Document object model: Objects and collections, Extensible Markup Language (XML) and RSS: Advantages and applications, structuring data, XML namespaces, Document Type Definitions (DTDs), XML vocabularies, RSS. Other	2

	advanced internet technologies: including HTML5, JSON and	
	JQuery.	
7.	Introduction to .NET: Overview of the .NET Framework -	1
	Common Language Runtime - Framework Class Library -	
	Understanding the C# Compiler.	
8.	Basics of C#: Working with Variables - Making Decisions.	1
	Classes and Objects: Methods – Properties - Interface- Partial	
	class- Null and Casting Handling Exceptions.	
9.	Windows and Dialogs: MDI – Dialogs, Lists: List Box - Tree	1
	view control - Menus and Toolbars - Delegates and Events	
	Generics.	
10.	Data Access With .Net: ADO.NET overview - Commands -	1
	Data Reader - XML Schemas - Populating a datasetNet	
	Programming with SQL Server: Reading and writing streamed	
	Xml - converting ADO.Net to Xml data.	
11.	ASP.NET Web Forms and Controls: Web Forms Controls -Data	1
	Binding and Data Source Controls – Validation, Controls-Master	
	and Content pages. The Asp.Net Application Environment:	
	Configuration Files - ASP.NET, Application Security -Caching.	
12.	Website Creation: Creation and hosting of websites including	1
	data connectivity.	
	Text Books	
1.	Deitel H.M. and P. J. Deitel, Internet & World Wide Web. How	to Program, 4/e,
	Prentice Hall, ISBN 0131752421, 2008.	
2.	J. Miller, V. Kirst and Marty Stepp, Web Programming Step by S	tep, Step by Step
	Publishing; 2nd edition (2012).	
3.	Stephen C. Perry, Core C# and .NET, Prentice Hall, New Jersey.	
4.	Peter Wright, Beginning Visual C# 2005 Express Edition: 1	From Novice to
	Professional, Apress.	
	References	
1.	http://www2.sta.uwi.edu/~anikov/comp3400/links.htm	
2.	http://www.cs.utsa.edu/~cs4413	
3.	http://www2.sta.uwi.edu/~anikov/comp3500/lectures.htm	
4.	Mastering Computer Networks: An Internet Lab Manual", J	. Liebeherr, M.
	El Zarki, Addison-Wesley, 2003.	
5.	A.Rodriguez, J.Gatrell, J.Karas, R.Peschkem, TCP/IP Tutorial and	Technical
	Overview, IBM Redbook (available over the Net)	

<u> </u>		Institute of Technology Srina	agar	
Course T				<u> </u>
Departm	ent Computer Scienc Engineering	ce & Course Coo	de CST010)
Credits	03	L	T	Р
Course T	ype Theory	3	0	0
		Course Objectives		
fading), s cellular sy	mall-scale and large-sc stems, Detailed discuss MIMO, Wireless Channe	wireless channel and the rela ale propagation effects ,Und ion of Multiple Access (TDM el Capacity, Exposure to curre	erstanding of IA/CDMA/OFI	the design of OM), Antenna
r ·	outcomes of the course a	Learning Outcomes		
Definition Definition The course	etermine the type and ap stem parameters and the esign wireless communic se enables a student to	four generations of wireless sta ppropriate model of wireless property of the wireless mediu ation systems with key 3G and Course Synopsis understand various concepta- ication and ad-hoc networks	fading channel Im. 1 4G technolog	based on the
propagano				
Unit	(Course Outline / Content Topics		Week
	Overview of Collular Sy	stems and evolution 2g/3G/4G	2/5G	1
		fects and Channel Models	00	1
		wing, Fading margin, Shadowi	ing margin	2
4.		equency reuse, Cochannel and		2
5.	C/I, Handoff, Blocking,	Erlang Capacity		1
	Wireless propagation Pa Noise figure of receiver	urt 1 - Link budget, Free-space	e path loss,	2
7.	Wireless propagation			1
	Antenna Diversity			1
	Wireless Channel Capac			1
10.	CDMA , MIMO, OFDM			2
		Text Books		
	edition) Pearson, 2010	ess Communications – Principl		
2.	Goldsmith, "Wireless Co	ommunications," Cambridge U	Iniv Press, 2005	5
1		References	1	
1		ommunications," McGraw Hil		
	•	rn Wireless Communications"		
2.	A Molace "WY	communications," Wiley, 2005		

		Department of Computer	0	0	
		National Institute of T		ar	
Course		Fault Tolerant Computing	Semester		
Departr	nent	Computer Science &	Course Code	CST01	1
		Engineering			
Credits		03	L	Т	P
Course	Туре	Theory	3	0	0
		Course Ob	ojectives		
•]	Го exan	nine the concepts and technique	es for redundant de	esigns, whi	ch can make
S	ystem f	ault tolerant.			
•]	Го discu	iss the importance of fault tolerar	nce in the design of	safety criti	cal systems.
•]	Го еха	mine testing techniques and	algorithms in	hardware,	software an
C	ommun	nications.	0		
		Learning O	Outcomes		
After co	mpletio	n of this course the students show			
	-	the fundamentals and design pro-		nt systems.	
	-	and the issues of reliability and		•	n of compute
	ystems.	-			, or compute
2	<i>ysterns</i> .	Course Sy	vnonsis		
Basic c	oncents	; Fault-Tolerant Design Techr		and avail	ability models
		f fault tolerant computers; So			
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wireless		networks and Internet.		lance, lau	
		networks and Internet. Course Outlin			
Unit	/mobile	networks and Internet. Course Outlin Topics	ne / Content		Week
	/mobile	networks and Internet. Course Outlin Topics amental Concepts: Definitions	ne / Content s of fault tolerand	ce, fault	
Unit 1.	/mobile Fund classif	networks and Internet. Course Outlin Topics amental Concepts: Definitions fication, fault tolerant attributes a	ne / Content s of fault tolerand and system structur	ce, fault e.	Week 2
Unit	/mobile Fund classif Fault	networks and Internet. Course Outlin Topics amental Concepts: Definitions fication, fault tolerant attributes a -Tolerant Design Techniques:	ne / Content s of fault tolerand and system structur information redu	ce, fault e.	Week
Unit 1. 2.	/mobile Funda classif Fault hardw	networks and Internet. Course Outlin Topics amental Concepts: Definitions fication, fault tolerant attributes a -Tolerant Design Techniques: vare redundancy, and time redund	ne / Content s of fault tolerand and system structure i Information redu dancy.	ce, fault e. indancy,	Week 2 2
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Unit 1. 2. 3.	/mobile Funda classif Fault hardw Deper availa model	networks and Internet. Course Outlin Topics amental Concepts: Definitions fication, fault tolerant attributes a Tolerant Design Techniques: vare redundancy, and time redund ndability Evaluation Techn bility models: (Combinatoria ls, Markov models), Performabili	ne / Content s of fault tolerand and system structure information reduction dancy. niques: Reliabilition techniques, Fa ity Models.	ce, fault e. indancy, ty and ult-Tree	Week 2 2 3
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Unit 1. 2. 3. 4. 5.	/mobile Funda classif Fault hardw Deper availa model Archi Gener system Softw manif Tolera sharec Recer	Course Outlin Course Outlin Topics amental Concepts: Definitions fication, fault tolerant attributes a Tolerant Design Techniques: are redundancy, and time redund ndability Evaluation Technic bility models: (Combinatoria high-avail ndability Evaluation Technic bility models: (Combinatoria bility models: (Design techniques, a	ne / Content s of fault tolerand and system structure information reduction dancy. niques: Reliabilities techniques, Fa ity Models. Computers (case lability systems, for tware faults and reliability models ectures: Shared to erant networks. systems: Security and Internet.	ce, fault e. indancy, ty and ult-Tree study): long-life d their s. Fault pus and	Week 2 2 3 2 3 2 3 3 3
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Unit 1. 2. 3. 4. 5.	mobile Fund classif Fault hardw Deper availa model Archi Gener system Softw manif Tolera sharece Recer tolera	networks and Internet. Course Outlin Topics amental Concepts: Definitions fication, fault tolerant attributes a -Tolerant Design Techniques: vare redundancy, and time redund ndability Evaluation Techni bility models: (Combinatoria Is, Markov models), Performabiliti tecture of Fault-Tolerant C val-purpose systems, high-avail ns, critical systems. Tare Fault Tolerance: Soft estation, design techniques, ant Parallel/Distributed Archited memory architectures, fault tolerant nce in wireless/mobile networks Text Be Tolerant Systems by I. Koren and	ne / Content s of fault tolerand and system structure information reduction dancy. niques: Reliability l techniques, Fa ity Models. Computers (case lability systems, l tware faults and reliability models ectures: Shared be erant networks. systems: Security and Internet. ooks d C.M. Krishna	ce, fault e. indancy, ty and ult-Tree study): long-life d their s. Fault pus and	Week 2 2 3 2 3 3 3
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Department of Computer Science & Engineering National Institute of Technology Srinagar				
Course Title	Image Processing	Semester		
Department	Computer Science & Engineering	Course Code	e CST012	
Credits	03	L	Т	Р
Course Type	Theory	3	0	0

Course Objectives

To learn and understand the fundamentals of digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.

Learning Outcomes

Upon completion of this course, students will be familiar with basic image processing techniques for solving real problems. Student will also have sufficient expertise in both the theory of two-dimensional signal processing and its wide range of applications, for example, image restoration, image compression, and image analysis.

Course Synopsis

This course is an introduction to the fundamental concepts and techniques in basic digital image processing and their applications to solve real life problems. The topics covered include Digital Image Fundamentals, Image Transforms, Image Enhancement, Restoration and Compression, Morphological Image Processing, Nonlinear Image Processing, and Image Analysis. Application examples are also included.

Course Outline / Content				
Unit	Topics	Week		
1.	Introduction: Digital Image Processing, Steps in Digital Image Processing, Components of image processing System, Image sensing and acquisition, sampling and quantization, relationships between pixels.	2		
2.	Image enhancement techniques: Spatial domain, Frequency domain and using Fuzzy techniques. Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. Filtering in the Frequency Domain.	2		
3.	Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering Linear, Position-Invariant Degradations, Inverse Filtering, Wiener Filtering, Constrained Least Squares Filtering, Geometric Mean Filter.	2		
4.	Color Image Processing: Color Models, Color Transformations, Image Segmentation Based on Color.	2		
5.	Wavelets and Multiresolution Processing: Background, Multiresolution Expansions, Wavelet Transforms in One Dimension	2		

6.	Image Compression and Segmentation: Fundamentals, Image Compression Models, Compression Methods, Point, Line, and	2
	Edge Detection, Thresholding, Region-Based Segmentation.	
7.	Pattern Recognition: Introduction, importance, Features,	2
	Feature vectors, and classifiers, Supervised, unsupervised and	
	semi-supervised Learning, Bayes Decision Theory, Bayesian classification for Normal Distributions, The Naïve - Bayes	
	Classifier, The Nearest Neighbor Rule.	
	Text Books	
1.	Rafael C.Gonzalez and Richard E.Woods, "Digital Image Pr	ocessing", Third
	Edition, Pearson Education.	
2.	SergiosTheodoridis, KonstantinosKoutroumbas, Pattern Recognition	on.
	References	
1.	Pratt, W. K, "Digital Image Processing".	
2.	Anil K. Jain, "Fundamentals of Digital Image Processing", Prentic	e-Hall India,
	2007.	

Department of Computer Science & Engineering National Institute of Technology Srinagar				
Course Title	System Design using HDL	Semester		
Department	Computer Science & Engineering	Course Code	e CST013	
Credits	03	L	Т	Р
Course Type	Theory	3	0	0

Course Objectives

This course instructs the students in the use of VHDL ((Very High Speed Integrated Circuit Hardware Description Language) for describing the behaviour of digital systems. VHDL is a standardized design language used in computer/ semiconductor industry. This course will teach students the use of the VHDL language for representation of digital signals, use of IEEE standard logic package/library, design description, design of arithmetic, combinational, and synchronous sequential circuits.

Learning Outcomes

- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Be able to model complex digital systems at several level of abstractions; behavioral and structural, synthesis and rapid system prototyping.
- Be able to develop and simulate register-level models of hierarchical digital systems.
- Develop a formal test bench from informal system requirements.
- Be able to design and model complex digital system independently or in a team.

Course Synopsis

Design and evaluation of control and data structures for digital systems. Hardware design languages are used to describe and design both behavioral and register transfer level architectures and control units with a microprogramming emphasis. Cover basic computer architecture, memories, digital interfacing, timing and synchronization, and microprocessor systems.

Course Outline / Content				
Unit	Topics	Week		
1.	Introduction: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter.	2		
2.	Designing With Programmable Logic Devices: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PLAs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner.	2		
3.	Design Of Networks For Arithmetic Operations: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider.	1		
4.	Digital Design with SM Charts: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, Linked state machines.	2		
5.	Designing With Programmable Gate Arrays And Complex Programmable Logic Devices: Xlinx 3000 series FPGAs, Designing with FPGAs, Xlinx 4000 series FPGAs, using a one-	2		

	hot state assignment, Altera complex programmable logic			
6.	devices (CPLDs), Altera FELX 10K series COLDs.Floating - Point Arithmetic: Representation of floating-pointnumbers, Floating-point multiplication, Other floating-pointoperations.	1		
7.	Additional Topics In VHDL: Attributes, Transport and Inertial delays, Operator overloading, Multi-valued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and Text IO.	2		
8.	VHDL Models For Memories And Buses: Static RAM, A simplified 486 bus model, Interfacing memory to a microprocessor bus.	2		
	Text Books			
1.	Digital Systems Design Using VHDL by Charles H. Roth, Jr. John, 2nd Edition, Thomson.	and Lizy Kurian		
2.	The Student's Guide to VHDL by Peter J. Ashenden, Morgan Kaufmann.			
References				
1.	'Fundamentals of Digital Logic with VHDL Design', by S. Brown Third edition, McGraw Hill, 2009.	and Z. Vranesic,		

Department of Computer Science & Engineering National Institute of Technology Srinagar				
Course Title	Real Time Systems	Semester		
Department	Computer Science &	Course Code	CST014	
	Engineering			
Credits	03	L	Т	Р
Course Type	Theory	3	0	0
Course Objectives				

This course includes:

- Abstract models of timed computation and the analysis of scheduling algorithms.
- Understand the motivation, theoretical background, and some of the work that has been done in the field of real-time systems.

Learning Outcomes

After completion of course students will be able to:

- Explain fundamental principles for programming of real time systems with time and resource limitations.
- Describe the foundation for programming languages developed for real time programming.
- Account for how real time operating systems are designed and functions.
- Use real time system programming languages and real time operating systems for real time applications.
- Analyse real time systems with regard to keeping time and resource restrictions.

Course Synopsis

This course includes: Theory, algorithmic and protocol concepts, mechanisms, and implementations of real-time computer systems; Real-time scheduling, real-time synchronization, real-time operating system kernels, and real-time programming languages; Design and analysis of real-time resource management algorithms, their implementations in production operating system kernels, and real-time application development.

Course Outline / Content				
Unit	Topics	Week		
1.	Real Time Systems: Concept of Real Time System, Performance measures of Real Time System, Real Time Application. Real time computing - Concepts; Structure of a real time system – Characterization of real time systems and tasks - Hard and Soft timing constraints - Issues in real time computing, Design Challenges - Performance metrics - Prediction of Execution Time : Source code analysis, Micro-architecture level analysis, Cache and pipeline issues- Programming Languages for Real-Time Systems.	3		
2.	Task Assignment and Scheduling: Different task model, Scheduling hierarchy, Offline versus Online Scheduling, Clock Drives. Model of Real Time System,	2		
3.	Scheduling: Hierarchy scheduling of Periodic Task - Assumptions, fixed versus dynamic priority algorithms, schedulability test for fixed priority task with arbitrary deadlines. Scheduling of A-periodic and Sporadic Tasks. Scheduling for	3		

	applications having flavible constrains Schoduling Deal Time			
	applications having flexible constrains, Scheduling Real Time			
	Tasks in Multiprocessor and Distributed Systems.			
4.	Resources and Resource Access Control: Handling Resource			
	sharing and dependency among real time tasks - Assumptions on			
	resources and their usage, resource contention, resource access	3		
	control (Priority Ceiling Protocol, Priority Inheritance protocol,			
	Slack Based Priority Ceiling Protocol, Pre-emption Ceiling			
	Protocol).			
5.	Communication and Databases: Real Time Communication			
	(hard and soft real time communication, traffic scheduling	3		
	disciplines, QoS guarantees), Real Time Databases (Optimistic			
	vs Pessimistic concurrency control protocols).			
	Text Books			
1.	1. C.M. Krishna, Kang G. Shin, Real Time Systems, International Edition, McGra			
	Hill Companies.			
2.	Jane W.S. Liu, Real-Time Systems, Pearson Education India, 2000.			
	References			
1.	Philip A. Laplante and Seppo J. Ovaska, "Real-Time Syste	ems Design and		
	Analysis: Tools for the Practitioner'' IV Edition IEEE Press, Wiley	U		

		Department of Computer			
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Course		Unix & Shell Programming	Semester	00701	-
Departı	nent	Computer Science & Engineering	Course Code	CST01	.5
Credits		03	L	Т	Р
Course	Туре	Theory	3	0	0
		Course O	bjectives		
	ming f	wledge about Unix operating s or inter-process communication calls.			
		Learning	Outcomes		
-		is course, the student will be ab		anda and fi	14 - 4 - 4
	-	text data processing application	0	lands and m	ners;
	U	and develop text based user inte	-	alam rullu	
• (Underst	and user management, network	-	ckup utilitie	28.
Comme	n 00000	Course S		ning anit -	odage Catabia
		nands; Permissions; Command			
merrup	ts; Unix	system calls; Signal and Interro Course Outli		error recove	ry.
Unit					Week
<u> </u>	Ela	Topics and common commands - S	Shall Mara ahay	t filos	week
1.		tories- Unix system - Basic			
		mes - Permissions - modes - D			3
					5
		grep family - Other filters - the			
2		n scanning and processing lang			
2.		nand line structure - Metac		-	
		ands - Command arguments	-		
	-	t as arguments – Shell variables			2
	-	in shell programs - Bundle - S	-		3
		and line parameters - Exiting			
		ating arguments - Executing co		0	
		process - Trapping exit codes – G			
3.		mizing the cal command, Fun			
		Intil loops - Traps - Catching i			3
		write - Zap - Pick command -	News command -	Get and	
		acking file changes.			
4.		ard input and output – Program	-		
		n at a time printer - On bugs a			
	Zap p	oick - Interactive file comparison	on program - Acces	sing the	2
	enviro	onment - Unix system calls -	Low level I/O, File	e system	
		tories and modes, Processors, Sa		-	
5.		am development - Four functio			
		recovery – Arbitrary variable			
		vilation into a machine, Co			3
	-	tors, Functions and procedures			
	-	nacro package – Troff level –			
		al page - Other document prepa			
	Manu	ai page - Omei uocument biena			

1.	The Design of the Unix Operating System, Maurice J. Bach, First Edition, Pearson
1.	Education, 1999.
2.	Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson.
3.	Your UNIX the ultimate guide, Sumitabha Das, TMH, 2 nd Edition.
	References
1.	UNIX for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson
	Education.
2.	UNIX programming environment, Kernighan and Pike, PHI. / Pearson Education.
3.	The Complete Reference UNIX, Rosen, Host, Klee, Farber, Rosinski, Second Edition,
	TMH.

		Department of Compute National Institute of	6	0	
Course	Title	High Speed Networks	Semester		
Departr		Computer Science &	Course Code	CST01	16
Dopuiri		Engineering		0.0101	
Credits		03	L	Т	Р
Course		Theory	3	0	0
	-51	Course O	biectives	-	
• 7	Fo devel	op an understanding of the bas	<i>,</i>	orking te	chnologies.
		the concepts learnt in this cou		-	-
	networks	1			ingi speca
		Learning	Outcomes		
After co	mpletion	n of this course, students should			
	-	rate the knowledge of network		ation	
		nd configure networks to supp			
			Synopsis		
High spe	eed netw	vorks; Frame Relay Networks;	High Speed LANs; Qu	euing Mo	odels; TCP and
ATM co	ongestion	n control; protocols for QoS su	pport.		
		Course Outli	ine / Content		
Unit		Topics			Week
1.	High	speed networks, Frame Rela	y Networks, Asynchr	ronous	4
	transfe	er mode, ATM Protocol A	Architecture, ATM 1	ogical	
		ection, ATM Cell, ATM Servic	e Categories, AAL.		
2.	Ŭ	Speed LANs.			2
3.	-	ng Models, Single Server Que	· · · · · ·		4
		stion Control, Traffic Manage			
		t Switching Networks, Frame F			
4.		nd ATM congestion control, I			4
		es, Integrated services archited		onents,	
	service	es, queuing, protocols for QoS	support.		
			Books		
1.		uz A. Forouzan, Data Commu	nication and Network	ing, Thir	d Edition, Tat
		aw-Hill 2003			
2.		m stallings, "ISDN and broa		ame rela	ay and ATM'
	Pearso	on Education Asia, Fourth Editi			
	T	Refer			
1.	Andre 2002	w S. Tanenbaum, Computer 1	Networks, Fourth Edit	ion, Prer	ntice Hall Indi
2.	Tom S Hill, 2	Sheldon, Encyclopedia of Netw	orking and Telecomm	unication	, Tata McGrav

		Department of Computer S	-	-	
Course T	41.0	National Institute of Tec	Semester	r	
Course Ti		Advanced Algorithms		CST01	7
Departme	ent	Computer Science & Engineering	Course Code	CS101	/
Credits		03	L	T	Р
Course Ty	vno	Theory	3	0	0
Course Ty	ype	Course Obje	e	0	0
This cours	se giv	ves a broad yet deep exposure		vances of	the past few
extensive geometry, notions su handling in By the end • Us • Pro • De • Sel	use which ach as ntract. I of th e a su ove co sign r lect ap	thms. Thematically, the biggest of ideas such as randomm n are increasingly important in algorithm design in face of un ability, heuristic approaches, etc. Learning Ou e course, the student must be able itable analysis method for any giv prectness and running-time bound new algorithms for variations of p opropriately an algorithmic paradia ormally an algorithmic problem.	ess, approximati n most applicatio acertainty, approac tcomes e to: ven algorithm ds problems studied in	on, high ns. We w hes to ha	dimensional vill encounter
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4.	Linear Programming :Introduction, initial basic feasible	4
т.	solution. Feasibility of a system, Simplex Algorithm. Standard	т
	and Slack forms, Formulation of problems as linear programs,	
	Checking Feasibility of System using B – Rule Algorithm.	
	Optimization. KKT Algorithm. Expectations: Introduction,	
	Moments, Expectations of functions of more than one random	
	variable.	
5.	Computational complexity: Complexity measures, Polynomial	2
	versus non-polynomial time complexity; NP hard and NP	
	complete classes.	
	Text Books	
1.	Kishore S. Trivedi, "Probability & Statistics with Reliability	, Queuing, and
	Computer Science Applications" PHI	
2.	Cormen, Leiserson, Rivest, "Algorithms", PHI	
3.	Bressard, "Fundamentals of Algorithms", PHI	
	References	
1.	Steven S Skiena, "The Algorithm Design Manual" – Springer Pub	olications
2.	Knuth, "The Art of Programming", Addison Wesley Vol I and II	
3.	Michael T Goodrich, "Algorithm Design" WILEY Publications.	

		Department of Computer	e	0	
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Course		Reconfigurable Computing	Semester		_
Departr	nent	Computer Science &	Course Code	CST01	8
		Engineering			
Credits	T	03	<u> </u>	<u> </u>	P
Course	гуре	Theory Course Ob	-	0	0
		Course Ob	jecuves		
		Learning O	utcomes		
		ain fundamental knowledge and n FPGAs through class lectures.			
vпDL.		Course Sy	monsis		
Reconfig	gurable	Computing Hardware; Program	.	ble Svste	ms; Mapping
•		configurable Platforms; Applica	0 0	•	11 0
-		puting; FPGA Applications.			
,		Course Outlin	e / Content		
Unit		Topics			Week
1.	Reco	nfigurable Computing Hardwa	are: Device Archit	ecture.	2
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2.		outing Systems, Reconfiguration N ramming Reconfigurable Syste		els and	3
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	-	amming Data Parallel FPGA	-		
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		Vector Model, Operating	System Suppor	t for	
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3.		bing Designs to Reconfigurabl			3
		ing, FPGA Placement Placem			
		As, Data-path Composition, Spec			
		As, Retiming, Re-pipelining,		_	
		guration Bit-stream Generat	ion, Fast Comp	oilation	
		niques			
4.		ication Development: Impleme			3
		As, Instance-specific Design, Pre-	-		
	-	Computation, Distributed	·	ORDIC	
	Archi	tectures for FPGA Comput	ting, Hardware/Sc	oftware	
	Partit	ioning			
5.	Case	Studies of FPGA Appli	cations: SPIHT	Image	3
	Comp	pression, Automatic Target F	Recognition System	ns on	
	Recor	nfigurable Devices, Boolean	Satisfiability: C	reating	
	1			-	
	Solve	rs Optimized for Specific Proble	em Instances, Multi-	FPGA	

	Case Study Using FPGAs, Network Packet Processing in	
	Reconfigurable Hardware	
	Text Books	
1.	Scott Hauck and Andre DeHon, "Reconfigurable Computing – Th Practice of FPGA-based Computation", ELSEVIER 2008	e Theory and
	References	
1.	Christophe Bobda "Introduction to Reconfigurable Computing Algorithms, and Applications" SPRINGER 2007.	g: Architectures,
2.	JariNurmi, "Processor Design: System-On-Chip Computing FPGAs". SPRINGER 2008.	for ASICs and

		Department of Computer Sc.	-		g	
<u>О</u>	41	National Institute of Tech		gar		
Course Tit		Computer Vision Computer Science & Engineering	Semester	_	CST019	<u> </u>
Departmen	nι		Course Code			1
Credits		03 Theorem	L 3		T 0	P
Course Ty	pe	Theory Course Object	_		0	0
To introdu	<u></u>	Course Object		ntrodu	a stud	nta tha maio
		udents the fundamentals of image for				
		, and techniques of computer visio or various issues in the design of				
		To provide the student with prog				
		n and object recognition applications			, mom	mplementin
computer v	1510	Learning Out				
Δfter comr	letii	ig the course you will be able to:	comes			
-		basic concepts, terminology, theo	rias models a	nd ma	athods is	n the field o
		er vision.	nes, models a		smous 1	ii the field t
	-	e known principles of human visual	evetem			
		e basic methods of computer vision	-	i_scal	e renreg	entation eda
		n and detection of other primitives,				
		a design of a computer vision system				ogintion.
• Sug	gesi	Course Sync		, proo		
Computer	Vie	ion plays a very important role	<u> </u>			
	V 15			h ac	Machin	e and Robo
Intelligence	e T					
		ney provide the means for the macl	hine or robot to	o inte	ract inte	elligently wit
the outside	e wo	ney provide the means for the mach rld through visual perception. Visio	hine or robot to n is undoubted	o inte lly the	ract inte most p	elligently wit owerful of a
the outside senses and	e wo d ei	ney provide the means for the mach rld through visual perception. Visio nables robots to perform very f	hine or robot to n is undoubted flexible tasks	o inte lly the such	ract inte most p as mo	elligently wit owerful of a oving aroun
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	clustering, Split & merge, Rule-based Segmentation, Motion-	
	based segmentation.	
7.	Area Extraction: Concepts, Data-structures, Edge, Line-	
	Linking, Hough transform, Line fitting, Curve fitting (Least-	
	square fitting).	
8.	Region Analysis: Region properties, External points, spatial	
	moments, mixed spatial gray-level moments, Boundary analysis:	
0	Signature properties, Shape numbers.	2
9.	Facet Model Recognition: Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges,	2
	Recognition of shapes, Consisting labeling problem, Back-	
	tracking Algorithm Perspective Projective geometry, Inverse	
	perspective Projection, Photogrammetry - from 2D to 3D.	
10.	Image matching: Intensity matching of ID signals, Matching of	2
10.	2D image, Hierarchical image matching, 2D representation,	_
	Global vs. Local features.	
	General Frame Works for Matching: Distance relational	
	approach, ordered structural matching, View class matching,	
	Models database organization.	
11.	General Frame Works: Distance -relational approach, Ordered	1
	-Structural matching, View class matching, Models database	
	organization.	
12.	Knowledge Based Vision: Knowledge representation, Control	1
10	strategies, Information Integration.	1
13.	Object recognition: Hough transforms and other simple object	1
	recognition methods, Shape correspondence and shape matching	
	Principal component analysis, Shape priors for recognition	
1.	Text Books	hanira Addison
1.	"Computer and Robot Vision", Robert Haralick and Linda S Wesley.	mapiro, Addisoli
2.	"Computer Vision: A Modern Approach", David A. Forsyth, Jean	Ponce
3.	"Introductory Techniques for 3D Computer Vision", E.Trucco and	
5.	References	
1.	"Image Processing, Analysis, and Machine Vision", Milan Sonka	, Vaclav Hlavac.
	Roger Boyle, Thomson Learning.	, ,
2.	"Robot Vision", by B. K. P. Horn, McGraw-Hill.	
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Course		Advanced Computer Netw	vork Semester Course Code	CST02	20
Departı	nent	Computer Science &	gineering		20
Credits		03	L	T	Р
Course		Theory	3	0	0
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This courses architect or engage	Fo unde applicat: Fo disc solution Fo iden course s urse will papers er of ha manag tures. A ge in net Intro Revie Async and s emula Elemo TCP contro	ions and services requirement rstand theoretical and practi- tions and services; uss relevant management is s; tify and assess possible re- cope. Cour- l focus on advanced networ as well as current and emen- inds-on lab assignments. Sp gement, network measurem s such the course is suitable tworking related research. Course O Top duction to Computer Network chronous Transfer Mode: A witching fabrics, network 1 tion. sport Layer ents of transport protocols and UDP, TCP connec	nts; cal concepts behind the ssues and devise adequ esearch opportunities an se Synopsis rking topics by studying rging topics in computer becific focus areas will nent, software defined e for Masters and PhD st utline / Content ics vorks ts and layered archi ATM layered model, sw ayer in ATM, QOS, an	design of n ate networ nd difficul g a combin networkin include clo networkin udents wis itecture. vitching nd LAN otocols:	multiconstained rk managemen lties within th nation of classin ng and by doin oud computing g and network shing to explor Week

	Application layer protocols: DNS, FTP, TFTP, TELNET, HTTP and WWW, SMTP and electronic mail; Network management and SNMP.	
4.	Wireless and Mobile: Wireless and Mobile Networks: Wireless links and network characteristics, 802.11 wireless LANs, mobility management, addressing and routing, mobile IP, WAP, mobility in cellular networks.	3
5.	Multimedia Networking: Streaming audio and video, RTSP, jitter removal and recovery from lost packets; Protocols for real-time interactive applications: RTP, RTCP, SIP, H.323; Content distribution networks; Integrated and differentiated services, RSVP.	2
6.	Introduction to Network Security Cryptography, symmetric and public-key algorithms, digital signatures, communication security, authentication protocols, E- mail security, PGP and PEM.	2
	Text Books	
1.	Kurose, J. F. and Ross, R.W, Computer Networking, Pearson Educa	ation
1	References	
<u> </u>	Comer, D.E. and Droms, R.E, Computer Networks and Internets, P Walrand, J. and Varaiya, P, High Performance Communication Ne	
2.	Kaufmann.	

	Department of Computer Science & Engineering National Institute of Technology Srinagar						
Course Title	Course Title Advanced Computer Graphics Semester						
Department	Computer Science & Engineering	Course Co	de CST021				
Credits	Credits 03 L T P						
Course Type	Theory	3	0	0			
	a						

Course Objectives

This course is a computer graphics class at the graduate level. The course mainly consists of lectures covering recent research results, ranging from mesh processing, simulation, to non-photorealistic rendering necessary basic mathematical and computation tools will be introduced when needed. Everyone will be expected to complete one or two individual project(s), present one paper related to a chosen research topic (as a team), and complete a (team) project.

Learning Outcomes

Students completing this course are expected to be able to:

- Understand the basics of geometry processing.
- Understand and work with advanced rendering methods such as radiosity.
- Design programs for advanced animation methods.
- Understand issues of modern graphics research.

Course Synopsis

This course covers advanced topics in computer graphics. We will focus on two specific questions: How to create photo-realistic renderings and how to create physically plausible animations? To answer the first question, we will first discuss and analyze the classical raytracing algorithm. With an understanding of the limitations of raytracing, we will look at a more principled way of image synthesis based on the physics of light transport. After studying the basic physical quantities of light transport and corresponding local illumination models, we will derive the global rendering equation as a model for image synthesis. We then discuss Monte Carlo methods for evaluating this integral equation leading to several Monte Carlo rendering algorithms such as path tracing or photon mapping. In the second part of the course we will study concepts and algorithms for the animation of solids and fluids, and discuss principles of performance-driven character animation. Starting with simple particle systems and mass-spring networks, we will discuss numerical time integration methods commonly applied for computer animation. Rigid body simulation and elastic materials will also be covered. We then look at how the approximate solutions of the Navier-Stokes equations can be computed to simulate fluid flow. Finally, we study advanced methods for animating 3D characters based on recorded performances.

Course Outline / Content				
Unit	Topics	Week		
1.	Advanced Rendering Techniques: Photorealistic rendering,	3		
	Global Illumination, Participating media rendering, Ray tracing,			
	Monte Carlo algorithm, Photon mapping.			
2.	Texture Synthesis and Image Processing: Environmental	2		
	mapping, Texture synthesis, anisotropic image smoothing.			
3.	Volume Rendering: Volume graphics overview, Marching	3		
	cubes, Direct volume rendering.			
4.	Surfaces and Meshes: Subdivision, Distance fields and level	2		
	sets.			
5.	Physically-based Modeling: Stable fluid solver, Lattice	2		
	Boltzmann method.			

6.	Individual Project	2			
	Text Books				
1.	James D. Foley, Andries van Dam, Steven K. FeinerandJohn F. H	ughes, Computer			
	Graphics: Principles & Practices, Addison Wesley, 2nd edition in G	С, 1995.			
2.	Alan H. Watt and Mark Watt, Advanced Animation and Rende	ring Techniques:			
	Theory and Practice, Addison-Wesley, 1992.				
	References				
1.	Matt Pharr and Greg Humphreys, Physically based rendering, Mo	organ Kaufmann,			
	2004				
2.	Tomas Moller and Eric Haines Real-Time Rendering A K Peters	Ltd, 2nd edition,			
	2002.				

		er Science & Engineering	g
		Technology Srinagar	
Course		base Semester	
	Management Systems		
Departi		Course Code	CST022
	Engineering		I
Credits	03	L	T P
Course		3	0 0
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almost a principle in class recovery e.g., Inte	all disciplines of science and engine es and techniques of data and informa include processing and optimization , data stream systems, Advanced App ernet and intranet search engines), info	eering. In this course, we ation management. The po- pon of declarative queries plication Development, W	e will cover the cor- otential topics covered s, transactions, cras- eb data management
and XM	L), and data mining.	0.4	
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			idase systems.
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	Be familiar with the relational database	a theory and he able to y	write relational algebr
	expressions for queries.	e theory, and be able to w	
		ion of databases includin	a tha E D mathad an
	Mater design principles for logical design ormalization approach.	ight of uatabases, including	g the E-K method and
		atministrance and according too	hniques, file and neg
	Be familiar with basic database storage organizations, indexing methods include		iniques. The and pag
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	Master the basics of query evaluation to		
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		Synopsis	
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-	ation languages, and conversion am	-	
	efficient query evaluation, elemented Data, Introduction to XML. Per		
	dization, E-Commerce, HADOOP.	Iormance runnig, reno	mance Deneminarks
Standary		line / Content	
Unit	Topics		Week
1.	Physical Database Design & Tu		
1.	physical design and tuning decision		
	selection: Guideline for index select		
	Tools for index selection Databas	6	0
	Tuning Conceptual schema Tuning		
	Concurrency, Benchmarking.		
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2.		ng: Transaction Process	sing 2
2.	Advanced Transaction Processin Monitors, Transactional Workflo	•	•
2.	Advanced Transaction Processin Monitors, Transactional Workflo	ow, Real time transact	tion
2.	Advanced Transaction Processin	w, Real time transact	tion nt in
2.	Advanced Transaction Processin Monitors, Transactional Workflo System, Long duration Transactions	ow, Real time transact , Transaction Management saction Management, M	tion nt in

	Introduction to XML, XML hierarchical Model, DTD & XML	
	schema, XML Namespace, XML query & Transformation:	
	Xpath, XSLT, XQuery, Storage of XML data, XML	
	Technologies: DOM &SAX Interfaces X pointer, Xlink,	
	XHTML, SOAP, WSDL, UDDI, XML database Application.	
4.	Emerging Trends in Databases: Introduction, Motivation,	2
	Temporal databases, Spatial & geographic databases, Multimedia	
	Databases, Mobility & personal Databases.	
5.	Advanced Application Development: Performance Tuning,	3
	Performance Benchmarks, Standardization, E-Commerce,	
	Legacy Systems, Large-scale Data Management with HADOOP,	
	Semi structured database COUCHDB: Introduction, Architecture	
	and principles, features.	
	Text Books	
1.	Database system Concept by Silberschatz and Korth 6th Edition	
2.	Distributed Databases principles & systems by Stefano Ceri, Giuse	ppe Pelagatti
3.	Database Systems, Thomas Connolly, Carolyn Begg, Pearson 4th I	Edition
	References	
1.	Web Data Management, Abiteboul, Loana, Philippe et.al Cambridg	ge publication.
2.	Database Management Systems by Raghu Ramakrishnan and Joha	nnes Gehrke

		Department of Computer Sci	0	ing	
<u>a</u>		National Institute of Tech			
Course	Title	Advanced Computer	Semester		
_		Architecture			
Departi	nent	Computer Science &	Course Code	CST02	.3
		Engineering			
Credits		03	L	T	<u>P</u>
Course	Туре	Theory	3	0	0
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2.	Thread Procest Core, hetero optima Multi-	d Level Parallelism & Multi-Core d Level Parallelism, Simultaneous M soor Architecture: Types, Limitation Architecting with Multi-Core geneous cores, Shared recourses al resource sharing strategies, Perf Core Processors.	e Architecture Multi-Threading, I ns; Evolution of I e: Homogenous s, shared busses	Multi- and , and	3
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	application, Correctness Concepts: Critical Region, Mutual	
	exclusion, Synchronization, Race Conditions. Performance	
	Concepts: Simple Speedup, Computing Speedup, Efficiency,	
	Granularity, Load Balance. Multithreading in hardware, Chip	
	multiprocessing, current research and future trends.	
	Multi-Core Programming	
	Introduction to OpenMP, OpenMP directives, Parallel constructs,	
_	Work-sharing constructs, Data environment constructs,	2
5.	Synchronization constructs, Extensive API library for finer	3
	control, benchmarking multi-core architecture: Bench marking of	
	processors. Comparison of processor performance for specific	
	application domains.	
1	Text Books	1 0 4
1.	John L. Hennessy and David A. Patterson – Quantative Appro	bach – Computer
	Architecture 5th edition, Morgan Kaufmann, 2011.	
2.	Shameem Akhter and Jason Roberts, —Multi-Core Programming,	1st edition, Intel
	Press, 2006.	
	References	
1.	Vincent. P. Heuring, Harry F. Jordan -Computer System design	and Architecture
	2nd edition, Pearson, 2003.	
2.	Apman, Gabriele Jost, Ruud van van der Pas, -Using OpenMP:	Portable Shared
	Memory ParallelProgramming (Scientific and Engineering C	
	edition, MIT Press, 2007.	F
3.	H. J. Siegel.Interconnection Network for Large Scale Parallel Prod	Cassing McCrow
5.		cessing, wicdiaw
	Hill, 1990.	

		Department of Computer S	e	0		
		National Institute of Te		r		
Course	Title	Advanced Compilation Techniques.	Semester			
Departi	ment	Computer Science & Engineering	Course Code	CST	024	
Credits		03	L	Т	Р	
Course		Theory	3	0	0	
	• •	Course Obj	jectives			
	ies, incl	ic compiler knowledge, this uding control flow analysis, op				
		Learning Ou	utcomes			
After co	mpletio	n of this course, students will be	able to:			
• 1	Understa	inding of the challenges involv	ved in compilation		tic gap between	
i	nput an	l output languages, compiler eff	iciency and code q	uality)		
		unding of the phases involved			owledge of th	
		es applied.	_		-	
• .	Ability t	o understand design decisions in	n modern compilers	and to j	ustify these.	
•	Ability	to develop and apply modification	ations to standard	compila	ation technique	
•	whereve	r this is necessary.				
•	A bility t	1 1/1 / 1 1				
- 1	nonnty t	o analyse compilation tasks and	to apply standard of	compilat	ion techniques.	
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6.	Data dependence analysis: Dependence testing, dependence graphs.	1
7.	Loop transformations: Interchange, tiling, fusion,	1
	distribution, splitting Just-in-time compilation: fast global optimization.	
8.	Garbage collection: Automatic memory management and data	2
	locality.Optimal Integrated Code Generation with OPTIMIST	
	Text Books	
1.	Compilers by Alfred V. Aho , Monica S Lam, R Sethi, Jeffrey D). Ullman
2.	Mapping and Compilation: Methods and Techniques by K. K. Ra	ampal
	References	_
1.	https://www.ece.cmu.edu/~ece447/s13/lib/exe/fetch.php?advan	cedcachingppt
2.	David Bacon, Susan Graham, Oliver Sharp: Compiler Transform	nations for High-
	Performance Computing. ACM Computing Surveys, Decembe	r 1994, Volume
	26 Issue 4. Preprint	
3.	David A. Padua and Michael J. Wolfe: Advanced compiler optim	nizations for
	supercomputers.	

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7.	Discrete Logarithm Problem in Prime Fields, Generalized Discrete Logarithm Problem. Attacks against Discrete Logarithm Problem. Public Key Cryptosystems based on the Discrete Logarithm Problem.	2			
8	Elliptic Curve Cryptosystems. Digital Signatures.	1			
1.	Text Books 1. Hans Delfs, Helmut Knebl, "Introduction to Cryptography, Principles and				
	Applications", Springer Verlag.				
2.	Wenbo Mao, "Modern Cryptography, Theory and Practice", Pearso	on Education			
	References				
1.	A Graduate Course in Applied Cryptography by Dan Boneh and V	ictor Shoup			
2.	Introduction to Modern Cryptography (2nd edition) by Jonathan K	atz and Yehuda			
	Lindell				
3.	Handbook of Applied Cryptography by A. Menezes, P. Van Oorsc	hot, S. Vanstone.			
4.	O. Goldreich, Foundations of Cryptography, CRC Press.				

Department of Computer Science & Engineering

National Institute of Technology Srinagar

Course Title	Neural Networks	Semester		
Department	Computer Science & Engineering	Course Code	e CST026	
Credits	03	L	Т	Р
Course Type	Theory	3	0	0

Course Objectives

- To introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
- To understand the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
- To provide knowledge in developing the different algorithms for neural networks

Learning Outcomes

After completion of this course the students should be able to:

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

Course Synopsis

Basics of ANN-Mathematical model-Applications; Single Layer Perceptron; Multi Layer Perceptron; Associative Memory; Recurrent neural networks; Boltzmann machine; Self-organizing feature maps; Fuzzy neural networks, Genetic algorithms.

Course Outline / Content

Unit	Topics	Week
1.	Introduction to neural networks : Biological and Artificial neurons,McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm and Convergence, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Network Architectures.	2
2.	Multilayer networks:Sigmoid Neurons, Gradient Descent(GD) , Feedforward Neural Networks, Representation Power of Feedforward Neural Networks,Back propagation (BP) , Momentum Based GD, Nesterov Accelerated GD, Stochastic	3

	GD, Recurrent networks and unsupervised learning, Hopfield network - energy; stability; capacity,Boltzmann machine, Kohonen'sself organizing feature maps.	
3.	Associative memory: Auto associative memories, Hetero associative memories, performance measures, associative memory models, Applications of associative memories.	2
4.	Convolutional Neural Networks: Visualizing Convolutional Neural Networks, Guided Backpropagation,Fooling Convolutional Neural Networks.	2
5.	Neuro Evolution: Introduction to Neuro evolution, Weight evolution, Topology evolution, Learning rule evolution, Deep Neuro Evolution. Neuro evolution uses and introduction to evolutionary algorithms to build Neural networks	3
	Text Books	
1.	Limin Fu." Neural Network in Computer Intelligence", Tata Me Edition.	cGraw-Hill 2003
2.	Gene Sher, "handbook of Neuro evolution", Springer, Edition 1.	
	References	
1.	James A. Freeman David M. Skapura, "Neural Networks: Algorith Applications, And Programming Techniques". Pearson Publication	
2.	Ke-lin du, M.N.S Swamy, "Neural networks and statistical lea 2014 edition.	rning", Springer

		Department of Computer	6	0	
Course	Title	National Institute of T	Semester	·	
		Pervasive Computing Computer Science &	Course Code	CST02	7
Departı	пепі	Engineering	Course Coue	C5102	
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Course		Theory	3	0	0
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•]	Го study	the pervasive computing web b	ased applications.		
•]	Го study	voice enabling pervasive comp	uting.		
		PDA in pervasive computing.			
• 7	Fo study				
-	r o study	user interface issues in pervasiv	ve computing.		
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	level ADIs and second han dian	
	level APIs and event handling.	
_	Advanced MIDP Programming :	
5.	Network programming, MIDP database programming, MIDlet	2
	provisioning, Bluetooth application.	
	Developing VoiceXML Applications Developing VoiceXML	
6.	Applications: VoiceXML applications, VoiceXML TAGS,	2
0.	ECMAScript – Java Card Application: Java card VM, APDUs,	Ζ.
	java card API, host applications.	
	Text Books	
1.	JochenBurkhardt, Dr. Horst Henn, Stefan Hepper - Pervasive Com	puting
	Technology and Architecture of Mobile Internet Applications – Pea	
	2005.	
2.	JochenBurkhardt, Horst Henn, Stefan Hepper, Thomas Schaec&	Klaus Rindtorff:
	Pervasive Computing: Technology and Architecture of	Mobile Internet
	Applications, Pearson Education, New Delhi, 2006.	
	References	
1.	Dan Harkey, Shan Appajodu, Mike Larkin – Wireless Java Program	mming for
	Enterprise Applications WileyPublishing, Inc., 2001.	
2.	StefenPoslad: Ubiquitous Computing: Smart Devices, En	vironments and
	Interactions, Wiley, Student Edition, 2010.	
3.	A. Genco, S. Sorce: Pervasive Systems and Ubiquitous Compu	ting, WIT Press,
	2012.	
4.	Guruduth S. Banavar, Norman H. Cohen, ChandraNarayanas	wami: Pervasive
	Computing: An Application-Based Approach, Wiley Interscience,	2012.

	Department of Computer Sci National Institute of Tech	0	0	
Course Title	Distributed and Parallel	Semester		
	Computing			
Department	Computer Science &	Course Code	e CST028	
	Engineering			
Credits	03	L	Т	Р
Course Type	Theory	3	0	0

Course Objectives

To provide knowledge on principles and practice underlying in the design of distributed systems.

Learning Outcomes

By the end of the course, the students will be able to:

- Layout foundations of Distributed Systems;
- Introduce the idea of middleware and related issues;
- Understand in detail the system level and support required for distributed system;
- Understand the issues involved in studying data and design of distributed algorithms.

Course Synopsis

overview of parallel computing; Pipelined computations; communication technologies; clock synchronization; proof of correctness; complexity analysis; Distributed operating systems; algorithms for implementing DSM; load balancing; fault-tolerant models; Research issues in distributed systems.

	Course Outline / Content	
Unit	Topics	Week
1.	An overview of parallel computing, Languages and programming environments, Message passing computing, Partitioning and divide-and-conquer strategies, Pipelined computations, Synchronous computations, Load balancing and termination detection, Programming with shared memory.	2
2.	Algorithms and applications Components of distributed systems, Communication technologies, communication services.	1
3.	Distributed algorithms and protocols: examples of distributed algorithms, clock synchronization, logical and vector clocks, election algorithms, consensus algorithms, proof of correctness, complexity analysis.	2
4.	Distributed operating systems: system models, file services, name services, process synchronization and coordination, case studies.	2
5.	Distributed shared memory: algorithms for implementing DSM, coherence protocols.	1
6.	Distributed resource management: load sharing, load balancing, resource monitoring	2
7.	Failure recovery and fault tolerance: check-pointing, recovery, fault-tolerant models and protocols	2
8.	Research issues in distributed systems, real-time protocols, standardization issues, cluster and grid computing.	2
	Text Books	
1.	George Coulouris, Jean Dellimore and Tim KIndberg, "Dist Concepts and Design", Pearson Education.	ributed Systems

2.	Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet
	(DCC) by Kai Hwang, Jack Dongarra& Geoffrey C. Fox.
3.	Ajay D. Kshemkalyani and MukeshSinghal, "Distributed Computing – Principles.
4.	Andrew S. Tanenbaum and Maarten van Steen. "Distributed Systems: Principles
	and Paradigms" (DSPD), Prentice Hall
2.	Principles of Parallel Programming, by Calvin Lin and Larry Snyder, Addison-
	Wesley.
	References
1.	MukeshSinghal and N. G. Shivaratri, "Advanced Concepts in Operating Systems"
2.	Parallel Programming: Techniques and Applications Using Networked
	Workstations and Parallel Computers, by Barry Wilkinson, Michael Allen. Prentice
	Hall.
3.	Joshy Joseph and Craig Fellenstein, "Grid Computing", IBM Press.
4.	Algorithms and Systems", Cambridge University Press
5.	Nancy A. Lynch, Distributed Algorithms, Morgan Kaufmann Publishers.

	Department of Computer Sci National Institute of Tech	0	0	
Course Title	Cloud Computing	Semester		
Department	Computer Science & Engineering	Course Code	CST029	
Credits	03	L	Т	Р
Course Type	Theory	3	0	0
	Course Objec	tives		

This course will introduce various aspects of cloud computing, including fundamentals, management issues, security challenges and future research trends. This will help students (both UG and PG levels) and researchers to use and explore the cloud computing platforms.

Learning Outcomes

This course offers a good understanding of cloud computing concepts and prepares students to be in a position to design cloud based applications for distributed systems.

Course Synopsis

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

	Course Outline / Content	
Unit	Topics	Week
1.	Cloud Computing Basics:	
	Cloud Computing Overview; Characteristics; Applications;	1
	Internet and Cloud; Benefits; Limitations; Challenges.	
2.	Cloud Computing Services and Deployment Models:	
	Infrastructure as a Service; Platform as a Service; Software as a	2
	Service; Private Cloud; Public Cloud; Community Cloud; Hybrid	2
	Cloud	
3.	Cloud Computing vs Other Computing Technologies:	
	Overview of Grid, Peer-to-Peer, Pervasive and Utility	1
	Computing technologies; their characteristics and comparison	1
	between them	
4.	Accessing the Cloud:	_
	Hardware and Infrastructure requirements; Access Mechanisms:	2
	Web Applications, Web APIs, Web Browsers.	
5.	Cloud Storage and Cloud Standards:	2
	Overview; Storage as a Service; Cloud Storage Issues;	2
	Challenges; Standards	
6.	Security Issues:	2
	Securing the Cloud, Securing Data, Establishing identity and	2
	presence.	
7.	Developing Applications:	2
	Major Players in Cloud Business; Overview of Service Oriented	2
	Architecture; Tools for developing cloud services and	

	applications.	
8.	Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).	2
	Text Books	
1.	Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter: Clou Practical Approach, McGraw Hill, 2010.	d Computing: A
2.	Kai Hwang, Jack Dongarra& Geoffrey C. Fox.:Distributed and C Clusters, Grids, Clouds, and the Future Internet (DCC)	loud Computing:
	References	
1.	RajkumarBuyys, James Broberg, AndrzejGoscinski (Editors) : C Principles and Paradigms, Wiley, 2011.	loud Computing:
2.	Barrie Sosinsky : Cloud Computing Bible, Wiley, 2011.	
3.	Judith Hurwitz, Robin Bloor, Marcia Kaufman, FernHalper : Clou Dummies, Wiley, 2010.	d Computing for
4.	BorkoFurht, Armando Escalante (Editors) : Handbook of Cl Springer, 2010.	oud Computing,

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~		National Institute of Tec		r	
Course		Software Project Management	Semester	GGTOO	0
Departi	ment	Computer Science &	Course Code	CST03	0
<u>a</u> 114		Engineering			
Credits		03	L 3	<u> </u>	P
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		the architecture of a model based a			
		e the process automation, process	management, cna	nge manag	ement, quant
1	manager	nent, monitoring and control.	taamaa		
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	•	and design the software architectu		• ,	
		exposure for organizing and mana		oject.	
		nalyze, design and develop the sof			
	-	various estimation levels of cost an			
		the knowledge of managing, econ	iomics for conven	tional, mod	lern and futur
5	software	nrolacte			
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	software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan.	
5.	Quality Planning: Quality Concepts, Procedural Approach toQuality Management, Quantitative Approaches to Quality	
	Management, Quantitative Approaches to Quanty Management, Quantitative Quality Management Planning, Setting the Quality Goal, Estimating Defects for Other Stages, Quality Process Planning, Defect Prevention Planning.	2
6.	Quality Management: Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formalapproaches to SQA, Statistical Software Quality assurances.	1
7.	Change Management: Software Configuration Management, The SCM repository, SCM Process, Configuration Managementfor Web Engineering.	1
8.	Project Execution And Closure: Reviews. The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Data Collection, Analysis and Control Guidelines, Introduction of Reviews and the NAH Syndrome.	2
9.	Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality, Risk-Related Monitoring. Project Closure: Project Closure Analysis.	2
	Text Books	
1.	Walker Rayce: "Software Project Management A Unified Framew Pearson Education, 2005.	ork", 1st Edition,
	References	
1.	Richard H.Thayer: "Software Engineering Project Management", 2 Computer Society, 1997.	2 nd Edition, IEEE
2.	Shere K.D: "Software Engineering and Management", 1st Edition 1988.	on, Prentice Hall,

		Department of Compute	6		g	
Course	Titla	National Institute of		gar		
Course Departr		Big Data Computer Science &	Semester Course Code	<u> </u>	CST031	
Departi	nent	Engineering	Course Cou	e	281031	
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course	турс		Objectives		0	Ū
		oks at concepts, technologi niques and algorithms that a	es for big data. T			
		of big data with cloud and vi				ilytics . In
			Outcomes			
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	•	on and data governance.	<i>J</i> · · · · · · · · · · · · · · · · · · ·	r		-1
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		Examining big data types, C				
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	unsupervised-learning, and stream mining.	
6.	Big Data Computational limitations, Big Data Emerging	1
	technologies.	
7.	Big Data NFR's., Data Privacy and Ethics, The privacy	1
	landscape, Preferences, Personalization and Relationships,	
	Rights and Responsibility, Can data be anonymized.	
8.	Need of distributed computing for Big Data, Virtualization and	2
	how it supports distributed computing, Cloud and Big Data,	
	Introduction to tools used for big data.	
	Text Books	
1.	Big Data: A Revolution That Will Transform How We Live, Wo	rk, and Think by
	Viktor Mayer-Schönberger, Kenneth Cukier	
2.	Big Data, Big Analytics: Emerging Business Intelligence and An	alytic Trends.
	by Michael Minelli, Michele Chambers, AmbigaDhiraj	
	References	
1.	https://www.slideshare.net/nasrinhussain1/big-data-ppt-3161629	0
2.	https://www.ntnu.no/iie/fag/big/lessons/lesson2.pdf	
3.	https://www.planet-	
	data.eu/sites/default/files/presentations/Big_Data_Tutorial_part4	.pdf

	Department of Computer Sci	ience & Engine	ering	
	National Institute of Tech	nology Srinaga	r	
Course Title	Cyber Laws & Forensics	Semester		
Department	Computer Science & Engineering	Course Code	CST032	
Credits	03	L	Т	Р
Course Type	Theory	3	0	0
	Course Objec	tives		
To maintain an	appropriate level of awareness, know	wledge and skill	required to r	ninimize the
occurrence and	l severity of incidents related to foren	sics and cyber la	aw.	
	Learning Out	comes		
After completi	ng the course you will be able to:			
 Interpret 	et and appropriately apply the laws a	nd procedures as	ssociated wit	h identifying
acquiri	ng, examining and presenting digital	evidence.		

- Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics.
- Employ fundamental computer theory in the context of computer forensics practices.
- Adhere to the ethical standards of the profession and apply those standards to all aspects of the study and practice of digital forensics.
- Using the scientific process, apply the principles of effective digital forensics investigation techniques.

Course Synopsis

As the name suggests, Cyber Law encapsulates the legal issues related to use of the Internet. IT law covers mainly the digital information (including information security and electronic commerce) aspects and it has been described as "paper laws" for a "paperless environment". India's The Information Technology Act 2000 has tried to assimilate legal principles available in several such laws (relating to information technology) enacted earlier in several other countries, as also various guidelines pertaining to information technology law. The Act gives legal validity to electronic contracts, recognition of electronic signatures. This is a modern legislation which makes acts like hacking, data theft, spreading of virus, identity theft, defamation (sending offensive messages) pornography, child pornography, cyber terrorism, a criminal offence. It is less a distinct field of law than intellectual property or contract law, as it is a domain covering many areas of law and regulation. Some leading topics include internet access and usage, privacy, freedom of expression, and jurisdiction. Our course is specially designed to make the participant an expert of Cyber Law Fundamentals and Digital Forensics. This is made possible by discussing the in-depth concepts of computers and networks, Cyber-crime and Cyber Terrorism, the hacking techniques used by terrorist communities, encryption standards they use and other algorithms as well. Concepts of Internet Security, Digital Signature and Electronic Payment System, Digital Law, Law of Intellectual Property.

	Course Outline / Content	
Unit	Topics	Week
1.	Introduction to Forensics and Cyber Crime: Fundamentals of	
	computer, Internet Technology, E-Governance & E-Business	
	,crime, criminology, origin, source, recent trends. Emergence of	
	information based society, economic, administration, social,	2
	dependence of use of information, accession, threats, civil	
	society and global society, Overview of computer forensics and	
	Investigative Techniques, Computer forensic tools, activities of	
	forensic investigations and testing methodology.	

Financial, Office Security, Cyber Crime – Complete transparency, hacking/cracking, denial of service, IP piracy,	
	2
phrasing, hetaerism etc. Cyber Attack – cyber attackers.	
3. Role of Computers and Internet in Cyber crime, penetration	
testing and auditing : Computer as witness, evidence, act,	
defining evidence, computer forensics, computer storage, media	
of electric record for use of course of law. Customers and legal	
agreements, Router penetration testing, Firewalls penetration	
testing, Intrusion detection system penetration testing, Wireless	
networks penetration testing, Password cracking penetration	3
testing, Social engineering penetration testing, Application	
penetration testing, Policies and controls testing. Penetration	
testing report and documentation writing, Policies and	
procedures Security Policies-checklist.	
4. Cyber Security: The concept of cyber security , meaning, scope	2
and the frame work, basic structure development and	
management, Rules, Regulations, Act, Legislation - Meaning,	
Scope, Difference between Rules.	
5. Need for a Cyber Act: The Indian Context, Need for a Cyber	3
Act , Information Technology Act , Scope and further	
Development, Information Technology Act (Amendment),	
coverage of Cyber Security and Cyber Crime Indian cyber Laws	
vs. cyber laws of U.S.A , similarities , scope and coverage ,	
Effectiveness.	
6. Laboratory work: Consists of gathering information, evidence	2
with tools like WinHex, Metasploit and Social Engineering	
toolkit.	
Text Books	
1. Cyber Forensics: from Data to Digital Evidence, Albert J. Marcella	a Jr., Wiley,1 st
Edition,2012	
2. Hack I.T Security Through Penetration Testing, T. J. Klevinsky,	Scott Laliberte
and Ajay Gupta, Addison-Wesley, 1st Edition,2002	
3. Computer Forensics: Cybercriminals, Laws, And Evidence, Marie	e-Helen Maras,
Jones & Bartlett Learn ,1st Edition ,2011.	
References	
1. Computer Forensics: Investigating Network Intrusions and Cyb	per Crime, EC
Council Press Series, Cengage Learning, 2010	
2. James, S.H. and Nordby, J. J "Forensic Science – An Introduction to	o Scientific and
Investigative Technique", CRC Press, USA (2003).	
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	Department of Computer Science National Institute of Tech	0	0	
Course Title	Expert Systems	Semester	L	
Department	Computer Science &	Course Code	CST03	3
Depui intent	Engineering	course coue	05105	5
Credits	03	L	Т	Р
Course Type	Theory	3	0	0
J	Course Object	tives		
various marke conceptual m understanding skill in incre	als with concepts, methods, and app ting issues. Unlike conventional ca aterial this course will attempt to into developing specific operational asing demand in corporations tod a human expert into an intelligent pro-	apstone, busines o provide skills models for impr ay. Methodolog	s courses to transla oved decisi gy used to	that focus of te conceptuation-making - transfer the
	Learning Outc	omes		
After completi	ng this course, the student should be a	able to:		
	he methodology to transfer human kr	nowledge into an	expert sys	tem.
	knowledge representation.			
-	a knowledge base.			
-	ent a rule-based expert system.			
	e Expert System tools.			
	e you with understanding of the role		elligence, E	Expert System
and De	cision Models in managerial decision	-making.		
	p abilities to apply, build and modify	decision models	to solve re	al problems
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Explor Based busines Introduction to	e the issues involved in the design a Decision Support Systems and disc s environment. Course Syno o Expert Systems, Knowledge Repre inty, Inexact Reasoning, Design of	nd development cuss the role th psis sentation, Infere	of Artifici ese system ence Metho	al Intelligence as play in the ods, Reasoning
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	Space Search: Depth First Search, Breadth First Search, DFID.				
	Heuristic Search: Best First Search, Hill Climbing, Beam Search.				
	Randomized Search: Simulated Annealing. Data Mining				
	Decision Trees, Neural Networks, Text Mining, Web mining				
	Current trends in AI.				
	Text Books				
1.	The Engineering of Knowledge-based Systems, A.J. Gonzalez and D. D. Dankel,				
	Prentice Hall, 1993.				
2.	A Guide to Expert Systems, Donald A. Waterman, Pearson publications.				
3.	Introduction to Knowledge Systems, Stefik M., Morgan Kaufmann.				
	References				
1.	Giarratano J., Riley G., Expert Systems, Principles and Programming, PWS				
	Publishing Company				

		Department of Computer S		-		
Course	Title	National Institute of Te	Semester	gar		
		Mobile Computing Computer Science &	Course Code		T034	
Departı	nent	Engineering			1054	
Credits		3	L	Т		Р
Course	Туре	Theory	3	0		0
	• •	Course Obj	ectives			
To stud	y the d	letails of lower layers of mobile		n the co	ntext o	of pervasive
computi	ng and	mobile applications.				
		Learning Ou				
By the e	nd of th	is course, the student will be able	to:			
• T	Underst	and algorithm/protocols, environm	nents and commu	inication	system	ns in mobile
C	computi	ng;				
• 1	Have an	understanding of MANETs;				
• 1	Evaluate	e the performance of TCP protoco	ls in Wireless Ne	tworks v	vith mo	bile nodes.
		Course Sy				
		MC; System architecture; Lo				ation for a
specializ		AC; DHCP; TCP; power		ontext-a	ware	computing
Commu	nicatior	s asymmetry; Wireless Application) .		
		Course Outline	e / Content			
Unit		Topics				Week
1.		le Computing (MC): Introd		C, nove	1	1
	applic	ations, limitations, and architectu	re			
2.	GSM	: Mobile services, System arch	itecture, Radio		-	
2.	GSM Proto	: Mobile services, System arch cols, Localization and calling,	itecture, Radio		-	2
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2.	GSM Protoc New c Wire	: Mobile services, System arch cols, Localization and calling, data services. less Medium Access Control: M	itecture, Radio Handover, Secu otivation for a sp	rity, and	t t	
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1.	Reza B"Far, "Mobile Computing Principles and Designing and Developing Mobile						
1.	Applications with UML and XML", Cambridge University Press, 2004.						
2.	JochenBurkhardt, et.al." Pervasive Computing, Technology and Architecture of Mobile Internet Applications", Addison Wesley, 2002.						
	References						
1.	UweHansmann, LotharMerk, Martin S. Nicklous, Thomas Stober, "Principles of Mobile Computing," Springer International, 2005.						
2.	Yi Bing Lin, "Wireless and Mobile Networks Architecture", John Wiley and Sons, 2000.						
3.	Tomasz Imielinski et.al, "Mobile Computing", Kluwer Academic Press, 1996.						
4.	UweHansmann, "Pervasive Computing Handbook. The Mobile World", IEE publication 2002.						

		Department of Com	-	-	-		
<u> </u>		National Institu			gar		
Course 7	l`itle	Green Computing		Semester			
D		Computer Science &		Course Cod	e CST()35	
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the envi technolog	ronmen gy tools	wledge to adopt green co at, skill in energy saving that can reduce paper was e equipment disposal requ	ng practice aste and can irements.	es in their tron footprin	use of har	dware, ez	xamin
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By the er	nd of th	is course, the student will	beable to:				
• 6	Bive an a	account of the concept gro	een IT;				
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4.	Green Networking: Where to save energy in wired networking,	
	Taxonomy of green networking research: Adaptive link rate,	
	Interface proxying, Energy ware infrastructure, Energy ware	4
	application.	
	Efficient-Efficient Data Canters: Reason for over power	
	consumption in data centers, Data center management	
	architecture in greener perspective.	
	Green Cellular Networking: Survey, Measuring greenness	
	metrics, Energy saving in base stations, Research issues,	
	Challenges, Future generation wireless systems, Wireless sensor	
	network for green networking.	
	Text Books	
1.	Bud E. Smith, "Green Computing: Tools and Techniques for	Saving Energy,
	Money, and Resources", Auerbach Publications.	
2.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Green IT	
	Information System's Environmental Impact While Adding to the	e Bottom Line",
	MC-Graw Hill.	
	Me Olaw IIII.	
3.	Jason Harris, "Green Computing and Green IT Best Practices on	U U
3.	Jason Harris, "Green Computing and Green IT Best Practices on Industry Initiatives, Virtualization, Power Management, Material	•
3.	Jason Harris, "Green Computing and Green IT Best Practices on	U U
3.	Jason Harris, "Green Computing and Green IT Best Practices on Industry Initiatives, Virtualization, Power Management, Material Telecommuting", Emereo Publishing.	•
	Jason Harris, "Green Computing and Green IT Best Practices on Industry Initiatives, Virtualization, Power Management, Material Telecommuting", Emereo Publishing. References	s Recycling and
3.	Jason Harris , "Green Computing and Green IT Best Practices on Industry Initiatives, Virtualization, Power Management, Material Telecommuting", Emereo Publishing. References John Lamb, "The Greening of IT-How Companies Can Make a D	s Recycling and
1.	Jason Harris , "Green Computing and Green IT Best Practices on Industry Initiatives, Virtualization, Power Management, Material Telecommuting", Emereo Publishing. References John Lamb, "The Greening of IT-How Companies Can Make a E Environment", Pearson Education.	s Recycling and
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1. 2.	Jason Harris , "Green Computing and Green IT Best Practices on Industry Initiatives, Virtualization, Power Management, Material Telecommuting", Emereo Publishing. References John Lamb, "The Greening of IT-How Companies Can Make a D Environment", Pearson Education. Greg Schulz, "The Green and Virtual Data Center", CRC Press.	Is Recycling and
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		Department of Computer				
ourse	Titla	National Institute of T Introduction to Robotics	Semester	<u>r</u>		
ourse	The	Infoduction to Robotics	Semester			
epartr	nent	Computer Science &	Course Code	CST03	6	
-p		Engineering			-	
redits			L	Т	P	
ourse	Туре	Theory				
		Course O	v v			
•]	Γo intro	duce the functional elements of	Robotics.			
•]	Го ітра	art knowledge on the direct and i	nverse kinematics.			
•]	Го intro	duce the manipulator differentia	l motion and control.			
•]	Го educ	ate on various path planning tecl	hniques.			
•]	Го intro	duce the dynamics and control of	of manipulators.			
			F			
		Course Outlin	ne / Content			
Unit		Topics			Week	
1.	BAS	IC CONCEPTS :				
		Brief history-Types of Robot–Technology-Robot classifications				
		and specifications-Design and control issues- Various				
	manipulators – Sensors - work cell - Programming languages.					
2.	DIRI	CT AND INVERSE KINEMA	ATICS:			
2.	DIRECT AND INVERSE KINEMATICS: Mathematical representation of Robots - Position and orientation					
		mogeneous transformation-Vario			3	
	using	the DenavitHattenberg parameter	ers -Degrees of freed	om-		
		t kinematics-Inverse kinematics-				
	Solva	bility – Solution methods-Close	d form solution.			
3.	MAN	IPULATOR DIFFERENTIAI	L MOTION AND			
		FICS :				
		r and angular velocities-Manipu				
		otary joints-Inverse -Wrist and a	e	с	4	
	analy	sis - Force and moment Balance			4	
4.	PAT	H PLANNING :				
		ition-Joint space technique-Use	of p-degree polynom	ial-		
	Cubic	c polynomial-Cartesian space tec	chnique - Parametric		4	
	descriptions - Straight line and circular paths - Position and					
	orien	tation planning.				
5	DVN	AMICS AND CONTROL:			2	
5		ingian mechanics-2DOF Manipu	llator-Lagrange Euler		2	
	-	alation-Dynamic model – Manip				
		r control schemes-PID control s				
		ic manipulator.				
	1	Text B				
1.		Mittal and I.J.Nagrath, Robotics	and Control, Tata Mc	Graw Hill	l, New	
	Delm	,4th Reprint, 2005.				

2.	JohnJ.Craig ,Introduction to Robotics Mechanics and Control, Third edition,						
	Pearson Education,						
3.	M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, Industrial Robotics, McGraw-						
	Hill Singapore, 1996.						
	References						
1.	AshitavaGhoshal, Robotics-Fundamental Concepts and Analysis', Oxford						
	University Press, Sixth impression, 2010.						
2.	K. K.AppuKuttan, Robotics, I K International, 2007.						
3.	Edwin Wise, Applied Robotics, Cengage Learning, 2003.						
4.	B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied						
	Publishers, Chennai, 1998						
5.	R.D.Klafter, T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated						
	Approach, Prentice Hall of India, New Delhi, 1994.						
6.	S.Ghoshal, "Embedded Systems & Robotics" – Projects using the 8051						
	Microcontroller", Cengage Learning, 2009.						

		Department of Compute				
			Technology Srinagar	•		
Course	Title	Data Analytics	Semester			
) eparti	nent	Computer Science &	Course Code	CST03	7	
, cpui ii	nent	Engineering	Course coue	00105	,	
Credits			L	Т	Р	
Course	Туре	Theory				
		Course (Objectives			
•]	Be expo	sed to big data.				
• 1	Learn th	e different ways of Data Analy	ysis.			
•]	Be fami	liar with data streams.				
• 1	Learn th	e mining and clustering.				
•]	Be fami	liar with the visualization				
			line / Content			
Unit		Topics			Week	
1.		RODUCTION TO BIG DATA				
		luction to Big Data Platform –	-		2	
		ns - Web data – Evolution of A		•	3	
		processes and tools, Analysis vs reporting - Modern data analytic				
		tools, Stastical concepts: Sampling distributions, resampling,				
	statistical inference, prediction error					
2.	DAT	A ANALYSIS:				
۷.		ession modeling, Multivariate a	nalysis Bayesian mod	eling		
	-	ence and Bayesian networks, Su		-	3	
		ods, Analysis of time series: lin			U	
		near dynamics - Rule induction		rning		
		eneralization, competitive learn		-		
		sis and neural networks; Fuzzy				
	2	ls from data, fuzzy decision tre	0 0 0			
	metho	· · · ·				
3.		ING DATA STREAMS:				
		luction to Streams Concepts –				
		ecture - Stream Computing, Sa				
		ing streams – Counting distinct		-		
		ating moments – Counting one			4	
	_	ying window - Realtime Analy				
		cations - case studies - real time	e sentiment analysis, st	ock		
4	-	et predictions.				
4.		QUENT ITEMSETS AND C				
		ng Frequent itemsets - Market b			A	
	0	ithm – Handling large data sets	-	mited	4	
		algorithm – Counting frequent				
		ering Techniques – Hierarchica				
		limensional data – CLIQUE ar n based clustering methods – C				

	space – Clustering for streams and Parallelism.	
5	FRAMEWORKS AND VISUALIZATION:	2
	Map Reduce – Hadoop, Hive, Map R – Sharding – NoSQL	
	Databases - S3 - Hadoopistributed file systems – Visualizations -	
	Visual data analysis techniques, interaction techniques; Systems	
	and applications.	
	Text Books	
1.	Michael Berthold, David J. Hand, Intelligent Data Analysis, Spring	ger, 2007.
2.	AnandRajaraman and Jeffrey David Ullman, Mining of Massive	
	Datasets, Cambridge University Press, 2012.	
	References	
1.	Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunit	ies in Huge Data
	Streams with advanced analystics, John Wiley & sons, 2012.	_
2.	Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 I	Pete Warden, Big
	Data Glossary, O"Reilly, 2011.	_
3.	Jiawei Han, MichelineKamber "Data Mining Concepts and Techni	ques", Second
	Edition, Elsevier, Reprinted 2008.	

		Department of Compute	e	0		
<u>С</u> Т	241 -	National Institute of		ar		
Course T		Computational Biology	Semester	CST029		
Departm	ent	Computer Science &	Course Code	CST038		
Credits		Engineering 03		T	Р	
	'uno	Theory	3	0	0	
Course T	ype		Dbjectives	0	0	
•	- m rou		v	rtion of high	logical avetam	
	-	vide basic introduction to Syst			logical system	
		roaches in systems biology to a	•			
	-	an overview of Synthetic B		al computa	tional method	
di	scusse	ed with the help of tools and so	ftware.			
• To	o un	derstand the recent trer	nds in genomics	like to	xico-genomics	
pł	narmac	cogenomics, NGS etc.				
• To	o fan	niliarize the advanced topi	cs in CADD lik	e pharmac	odynamics 8	
		cokinetics.		1	2	
-		duce metabolomics with its pro	ofiling and analysis			
• 10	5 muo		Outcomes			
By the on	d of th	his course, the student will be a				
•		mathematical concepts involve				
	-	sic knowledge of modern mole	••	nomica		
		an algorithm for analysis of b		nonnes		
	-			oppropriato	to the differen	
		owledge to identify and devel al projects.	op in sinco models	appropriate	to the unrefer	
	0	nolecular methods to study ge	netic variation with	in and betw	veen species 6	
		and evaluate different phyloge			veen species o	
	-	y select systems biology too	-		nstructing an	
		ng complex biological processe	-		instructing and	
10	dermin		Synopsis			
System B	iology	, Gene Regulatory Network, F	V I	etwork.Svsr	thetic Biology	
		Synthetic biology, Engineering				
-		tics, Molecular dynamics simu			-	
			line / Content			
Unit		Торіся	5		Week	
	Syste	ms biology: Self-organization	n, emergence, modu	larity and		
1.	abstra	ction, feedback, control ana	lysis, Enzyme Kin	etics and		
	Thermodynamics: The Law of Mass Action; Reaction Kinetics, 3					
	Rate Equation, Michaelis-Menten Equation, Hill Equation,					
	Interaction networks overview- Gene Regulatory Network,					
		in – Protein Interaction Ne	••••			
		polic path-ways; network motif	• •	-		
		ards: Matlab Systems Biolo				
	(84	Diologra Charles				
		ems Biology Graphical Lar ns Biology- Cell designer; Cyt	• •	ools for		

	-	
2.	Synthetic Biology: Engineering Biology; design and construction of novel biological systems; Abstraction hierarchy-Part, Device, Systems; Bio-Bricks - a standard for (physical) DNA composition, Designing a biological system from Bio-bricks; iGEM; SBOL, Computational Synthetic biology: Codon optimization; AND gate and OR gate in biology; Operons; Switches and clocks; Re-pressilator; Applications- Environment, Energy, Pharmaceutical needs, Ethical issues of Synthetic Biology.	3
3.	Niche areas in Genomics: Toxic-genomics, Pharmacogenomics, Pharmaco-genetics, SNP, Personalized medicine, Meta-genomics, Comparative genomics, Functional genomics, structural genomics, QTL, HGP. Next Generation Sequencing methods, Overview of data compression, Need for compression, Scope of NGS data compression.	3
4.	Advanced topics in CADD: Molecular dynamics simulations, Force fields, Energy minimization, pharmacodynamics & pharmacokinetics, 2D and 3D screening, Identification of targets in silico, GPCRs, Peptides as drugs, introduction to Ayur- informatics.	3
5.	Metabolomics: Metabolism, metabolomite, metabolome, metabolomic separation and analysis techniques, metabolic profiling, metabolic fingerprinting, Metabolome informatics. Resources/databases of metabolomics, Applications; Epigenetics	3
	Text Books	
1.	Alon, U. (2006). An introduction to systems biology: design princip biological circuits. CRC press.	ples of
2.	Gautham, N. (2006). Bioinformatics: Databases and Algorithms. Al Int'l Ltd.	lpha Science
3.	Benson, G. (2003). Algorithms in Bioinformatics. Springer Berlin H	Heidelber
	References	
1.	Choi, S. (Ed.). (2007). Introduction to systems biology. New J Press.	ersey:: Humana
2.	Demin, O., &Goryanin, I. (2010). Kinetic modelling in system Press.	s biology. CRC
3.	Gusfield, D. (1997). Algorithms on strings, trees and sequences: c and computational biology. Cambridge University Press.	computer science
4.	Iyengar, S. (2010). Symbolic Systems Biology. Jones and Bartlett.	

Department of Computer Science & Engineering National Institute of Technology Srinagar						
Course Title	Special Topics in Computer	Semester				
	Science					
Department	Computer Science &	Course Code	e CST039)		
-	Engineering					
Credits	03	L	Т	Р		
Course Type	Theory	3	0	0		

Course Objectives

This course will introduce students to this rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset. Students will learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication.

Learning Outcomes

After completion of this course students will be able to:

- Explain what Data Science is and the skill sets needed to be a data scientist.
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling.
- Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.
- Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.
- Build their own recommendation system using existing components.
- Reason around ethical and privacy issues in data science

Course Synopsis

Data Science is the study of the generalizable extraction of knowledge from data. Being a data scientist requires an integrated skill set spanning mathematics, statistics, machine learning, databases and other branches of computer science along with a good understanding of the craft of problem formulation to engineer effective solutions.

Course Outline / Content

Unit	Topics	Week
1.	Introduction: Introduction to Data Science, Steps in doing	
	data Science, Skills needed to do data Science, Datafication	1
2.	Statistical Inference Populations and samples, Statistical	
	modelling, probability distributions, fitting a model, Intro to R	1
3.	Exploratory Data Analysis and the Data Science Process -	
	Basic tools (plots, graphs and summary statistics) of EDA,	2
	Philosophy of EDA, The Data Science Process, Case Study:	
	RealDirect (online real estate firm)	
4.	Introduction to Machine Learning: Linear Regression ,K-	2
	Nearest Neighbors (K-NN), k-means, Motivating application:	
	Filtering Spam, Why Linear Regression and k-NN are poor	
	choices for Filtering Spam, Naive Bayes and why it works for	

	Filtering Spam, Data Wrangling: APIs and other tools for	
	scrapping the Web	
5.	Feature Generation and Feature Selection (Extracting	2
	Meaning From Data) - Motivating application: user (customer)	
	retention Feature Generation (brainstorming, role of domain	
	expertise, and place for imagination), Feature Selection algorithms	
	– Filters; Wrappers; Decision Trees; Random Forests.	
6.	Recommendation Systems : Building a User-Facing Data Product,	2
	Algorithmic ingredients of a Recommendation Engine,	
	Dimensionality Reduction, Singular Value Decomposition,	
	Principal Component Analysis, Exercise: build your own	
	recommendation system	
7.	Mining Social-Network Graphs: Social networks as graphs,	1
	Clustering of graphs, Direct discovery of communities in graphs,	
	Partitioning of graphs, Neighborhood properties in graphs.	
8.	Data Visualization Basic principles, ideas and tools for data	1
	visualization, Examples of inspiring (industry) projects, Exercise:	
	create your own visualization of a complex dataset.	
9.	Data Science and Ethical Issues: Discussions on privacy,	1
	security, ethics, A look back at Data Science, Next-generation	
	data scientists	

National Institute of Technology Srinagar Course Title System & Network Administration Semester Department Computer Science & Engineering Course Cole CST040 Credits 03 L T P Course Type Theory 3 0 0 Course Type Theory 3 0 0 Course objectives Course objectives 0 0 Students will be role and responsibilities of a system administrator 6. Configure the Unix operating system 7. Focuses on the principles and techniques used in the design of networks and development of networked and distributed software. 8. Students will be exposed to standard network design tools, and diagnostic tools, su as packet monitors and performance analysis tools. Enerning Outcomes Eearning Outcomes Oberonstrate an understanding of system components, the advantages of Unix OS. Design and diagnosis of networks will also be covered. Systems Administration will also be discussed, especially with respect to Netw Management; However, homework and programming assignments will be m focused on Network programming. Course Outline / Content Course Outline / Content Unit Topics Week 1			iter Science & Enginee of Technology Srinaga	-	
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1.	Nemeth, Snyder, Hein and Whaley " <u>UNIX and Linux System Administration</u> <u>Handbook</u> ", 4th Ed.(Prentice Hall, 2010)
2.	William Stallings: Data & Computer Communications, 7 th Ed,PHI
	References
4.	AndrewTanenbaum,-Computer Networks PHI

		Department of Computer Sci National Institute of Teel		ng	
Course	Titla	National Institute of Tech Pattern Recognition	Semester		
Departi		Computer Science &	Course Code	CST04	1
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		various simulation models and give		s for eacl	acatagory
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		Course Outline /	Content		
Unit		Topics	Content		
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	machine learning approaches, dictionary based approaches.				
	Discourse- Reference resolution, constraints on co-reference,				
	algorithm for pronoun resolution, text coherence, discourse				
	structure				
5.	Applications of NLP- Spell-checking, Summarization	3			
	Information Retrieval- Vector space model, term weighting,				
	homonymy, polysemy, synonymy, improving user queries.				
	Machine Translation– Overview.				
	Text Books				
1.	Daniel Jurafsky and James H Martin. Speech and Language Proces	ssing, 2e, Pearson			
	Education, 2009	_			
2.	James A Natural language Understanding 2e, Pearson Education,	1994			
	References				
1.	Bharati A., Sangal R., Chaitanya V Natural language proces	sing: a Paninian			
	perspective, PHI, 2000				

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4.	Algorithms With Superpolynomial Speed-Up: Quantum Phase	
	Estimation and the Quantum Fourier Transform, Eigenvalue	4
	Estimation, Finding-Orders, Finding Discrete Logarithms,	
	Hidden Subgroups, Related Algorithms and Techniques.	
	Algorithms Based on Amplitude Amplification: Grover's	
	Quantum Search Algorithm, Amplitude Amplification, Quantum	
	Amplitude Estimation and Quantum Counting, Searching	
	Without Knowing the Success Probability, Related Algorithms	
	and Techniques	
5.	Quantum Computational Complexity Theory and Lower	
	Bounds: Computational Complexity, The Black-Box Model,	4
	Lower Bounds for Searching in the Black-Box Model: Hybrid	
	Method, General Black-Box Lower Bounds, Polynomial	
	Method, Block Sensitivity, Adversary Methods.	
	Quantum Error Correction: Classical Error Correction, The	
	Classical Three-Bit Code, Fault Tolerance, Quantum Error	
	Correction, Three- and Nine-Qubit Quantum Codes, Fault-	
	Tolerant Quantum Computation.	
1	Text Books	
1.	Eleanor G. Rieffel and Wolfgang H. Polak, "Quantum Comp	uting: A Gentle
	Introduction"	
1	References	1.0
1.	Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation	on and Quantum
	Information".	
2.	Phillip Kaye, Raymond Laflamme, and Michele Mosca (2007). Ar	Introduction to
	Quantum Computing. Oxford University Press.	
3.	Yanofsky, Noson S. and Mirco A. Mannucci (2008). Quantum Con	mputing for
	Computer Scientists. Cambridge University Press.	
4.	McMahon, David (2008). Quantum Computing Explained. John W	/iley & Sons,
	Inc.	
5.	Mermin, N. David (2007). Quantum Computer Science: An Introd	uction.
	Cambridge University Press.	

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<u>C/C++.</u> <u>Unit</u> 1.	required There w Feedf propa gradie avoid accele Conve poolin Recur archit Deep denoi Adver Atten Appli segme	d to pass a math prerequisites terminal to pass a math prerequisites terminal project of the assignments and a final project of the adversed of the assignment and the assignment of the assignment and the assignment of t	st), as well as priject. c / Content ent descent and ion, aka the viscous te it. RelU Heur for faster training ation. Dropout. hitectures, conv GRU, Encoder coders (standard riational Autor bencoder and DB amic memory for Computer Vision matic image ca ersarial networks	the bac vanishin istics fo g. Nestor olution Decode l, sparse encoder M network n: Imag uptioning , video t	ning in ck ng or rs / er e, rs, s. ge g, to	Week

	Bag-of Words model (CBOW), Glove, Evaluations and	
	Applications in word similarity, analogy reasoning: Named	
	Entity Recognition, Opinion Mining using Recurrent Neural	
	Networks	
5.	Named Entity Recognition, Opinion Mining using Recurrent	3
	Neural Networks: Parsing and Sentiment Analysis using	
	Recursive Neural Networks: Sentence Classification using	
	Convolutional Neural Networks: Dialogue Generation with	
	LSTMs (1 lecture) Applications of Dynamic Memory Networks	
	in NLP (1 lecture) Recent Reseearch in NLP using Deep	
	Learning: Factoid Question Asnwering, similar question	
	detection, Dialogue topic tracking, Neural Summarization, Smart	
	Reply	
	Text Books	
1.	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "De	ep learning." An
	MIT Press book in preparation. (2015)	
2.	Bengio, Yoshua. "Learning deep architectures for AI." Foundation	ons and trends in
	Machine Learning 2.1 (2009): 1127.	
	References	
1.	Hochreiter, Sepp, and Jargen Schmidhuber. "Long short-term 1	nemory." Neural
	computation 9.8 (1997): 17351780.	-

		Department of Computer			
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Course	Title	Introduction to Data Science	Semester		
Depart	ment	Computer Science &	Course Code	CST045	
-		Engineering			
Credits		03	L	T	P
Course	Туре	Theory	3	0	0
		Course O	bjectives		
ts basic echniqu lata col	c principle les and too llection an	troduce students to this rapid s and tools as well as its g ols they need to deal with van d integration, exploratory da duct creation, evaluation, and	eneral mindset. Students v rious facets of data science ata analysis, predictive mo d effective communication.	will learn cor practice, inc odeling, desc	ncepts luding
A. C		Learning (
	•	of this course students will be			
	1	at Data Science is and the sk			
		c machine learning algorithm	e e e e e e e e e e e e e e e e e e e	arest Neighb	ors (k
]	NN), k-me	ans, Naive Bayes) for predict	tive modeling		
	• •	robability distributions con	nmonly used as foundati	ions for stat	tistica
1	modeling.	Fit a model to data.			
•]	Explain the	e significance of exploratory	y data analysis (EDA) in d	lata science.	Appl
1	pasic tools	(plots, graphs, summary stati	istics) to carry out EDA.		
•]	Build their	own recommendation system	n using existing component	s.	
•]	Reason aro	und ethical and privacy issue	es in data science		
		Course S	Synopsis		
data sci learning	ientist req	the study of the generalizable uires an integrated skill se and other branches of comp alem formulation to engineer	et spanning mathematics, puter science along with a effective solutions	statistics, m	achin
		Course Outli	ne / Content		
		Topics			
Unit	_		~ . ~ .	Wee	ek
Unit 1.		tion: Introduction to Data S	1 0	ita	ek
1.	Science, S	tion: Introduction to Data S Skills needed to do data Scier	nce, Datafication	nta 1	ek
	Science, S Statistica	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations	nce, Datafication and samples, Statistic	ta 1 cal	ek
1. 2.	Science, S Statistica modelling	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations g, probability distributions, fit	nce, Datafication and samples, Statistic tting a model, Intro to R	nta 1 cal 1	ek
1.	Science, S Statistica modelling Explorat	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations g, probability distributions, fit ory Data Analysis and the I	nce, Datafication and samples, Statistic tting a model, Intro to R Data Science Process - Bas	nta 1 cal 1 sic	ek
1. 2.	Science, S Statistica modelling Explorat tools (plo	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations g, probability distributions, fit ory Data Analysis and the I ts, graphs and summary stati	nce, Datafication and samples, Statistic tting a model, Intro to R Data Science Process - Bas stics) of EDA, Philosophy	tta 1 cal 1 sic of 2	ek
1. 2.	Science, S Statistica modelling Explorat tools (plo EDA, Th	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations g, probability distributions, fit ory Data Analysis and the I ts, graphs and summary stati- e Data Science Process, Cas	nce, Datafication and samples, Statistic tting a model, Intro to R Data Science Process - Bas stics) of EDA, Philosophy	tta 1 cal 1 sic of 2	<u>ek</u>
1. 2. 3.	Science, S Statistica modelling Explorat tools (plo EDA, Th real estate	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations g, probability distributions, fit ory Data Analysis and the I ts, graphs and summary stati- e Data Science Process, Case firm)	nce, Datafication and samples, Statistic tting a model, Intro to R Data Science Process - Bas stics) of EDA, Philosophy se Study: RealDirect (onli	tta 1 cal 1 sic of 2	ek
1. 2.	Science, S Statistica modelling Explorat tools (plo EDA, Th real estate Introduc	tion: Introduction to Data S Skills needed to do data Scier I Inference Populations g, probability distributions, fit ory Data Analysis and the I ts, graphs and summary stati- e Data Science Process, Cas e firm) tion to Machine Learning:	nce, Datafication and samples, Statistic tting a model, Intro to R Data Science Process - Bas stics) of EDA, Philosophy se Study: RealDirect (onli Linear Regression ,K-	tta 1 cal 1 sic of 2 ne	ek
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	retention Feature Generation (brainstorming, role of domain	
	expertise, and place for imagination), Feature Selection algorithms	
	– Filters; Wrappers; Decision Trees; Random Forests	
6.	Recommendation Systems : Building a User-Facing Data Product,	2
	Algorithmic ingredients of a Recommendation Engine,	
	Dimensionality Reduction, Singular Value Decomposition,	
	Principal Component Analysis, Exercise: build your own	
	recommendation system	
7.	Mining Social-Network Graphs: Social networks as graphs,	1
	Clustering of graphs, Direct discovery of communities in graphs,	
	Partitioning of graphs, Neighborhood properties in graphs.	
8.	Data Visualization Basic principles, ideas and tools for data	1
	visualization, Examples of inspiring (industry) projects, Exercise:	
	create your own visualization of a complex dataset.	
9.	Data Science and Ethical Issues: Discussions on privacy,	1
	security, ethics, A look back at Data Science, Next-generation	
	data scientists	
	Text Books	
1.	Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk	From The
	Frontline. O'Reilly. 2014.	
2.	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Ma	ssive Datasets.
	v2.1, Cambridge University Press. 2014.	
3.	Foster Provost and Tom Fawcett. Data Science for Business: What Y	ou Need to
	Know about Data Mining and Data-analytic Thinking. ISBN 144936	1323. 2013.
	References	
1.	Foster Provost and Tom Fawcett. Data Science for Business: What	at You Need to
	Know about Data Mining and Data-analytic Thinking. ISBN 144936	1323. 2013.

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Course		Internet Of Things		Semester			
Depart	ment	Computer Science &		Course Cod	e (CST046	
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	WPAN Technologies for IOT/M2M, Cellular and Mobile	
	Network Technologies for IOT/M2M, Layer 3 Connectivity:	
	IPv6 Technologies for the IOT: Overview and Motivations.	
	Address Capabilities, IPv6 Protocol Overview, IPv6 Tunnelling,	
	IPSec in IPv6, Header Compression Schemes, Quality of Service	
	in IPv6, Migration Strategies to IPv6.	
4.	Case Studies illustrating IOT Design-Introduction, Home	2
	Automation, Cities, Environment, Agriculture, Productivity	
	Applications.	
5.	Data Analytics for IOT –Introduction, Apache Hadoop, Using	2
	Hadoop Map Reduce for Batch Data Analysis, Apache Oozie,	
	Apache Spark, Apache Storm, Using Apache Storm for Real-	
	time Data Analysis, Structural Health Monitoring Case Study.	
	Text Books	
1.	Daniel Minoli,"Building the Internet of Things with IPv6 and MIP	v6:The Evolving
	World of M2M Communications", Wiley, 2013.	
2.	Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands or	n Approach"
	Universities Press., 2015	
	References	
1.	Michael Miller," The Internet of Things", First Edition, Pearson, 2	015.
2.	Claire Rowland, Elizabeth Goodman et.al.," Designing Connected	Products", First
	Edition,O'Reilly, 2015.	

		Department of Computer Sc	0	0		
<u>a</u>		National Institute of Tec		ar		
Course '		Advanced Cryptography	Semester	COTO	47	
Departn	nent	1		e CST04	ST047	
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		fundamental concepts of compu	ter security and	cryptograp	ony and utiliz	
		niques in computing systems. about Pseudo-random Genera	tom (DDC) by	uilding o	Decudorandor	
		on and its applications.	$(\mathbf{FKG}), \mathbf{D}$	unung a	r seudorandor	
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		ture Schemes.	Aumentication	Loues (MA		
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		erstand the fundamentals of Crypt	ography			
		juire knowledge on standard al		o provide d	confidentiality	
		nd authenticity.	gontinnis used t		connacination	
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1		
6.	Network Security Internet security protocols, SSL,TLS TSP WAP security, SET Hashing Authentication & Signature	
	Schemes E-mail security, Email architecture SSL, PGP, MIME,	6
	S/MIME Internet Protocol Security (IPSec) IPSec architecture,	0
	IPSec verses other layers security Mobile IPSec, VPN, Web	
	security SSL, TLS, SET etc	
7	System Security Intruders, types of attacks, protecting against	
	Intruders honeypots, scanning and analysis tools, Viruses and	
	worms, types of viruses, protection, Firewall architecture	7
	implementing firewalls, xml firewalls, trusted systems, trusted	
	system applications, multi-level security, trusted products.	
	Security implementation, wireless security, securities in Adhoc-	
	networks.	
	Text Books	
1.	Cryptography And Network Security Principles and Practices W	Villiam Stallings,
	Prentice Hall	
2.	Cryptography and Network Security Atul Kahate, Tata McGraw-H	lill
3.	Cryptography and Network Security Behrouz A. Forouzan, TMH	
4.	Wade Trappe, Lawrence C Washington, " Introduction to Cr	yptography with
	coding theory", Pearson.	
	References	
1.	W. Mao, "Modern Cryptography – Theory and Practice", Pearson	Education
2.	Charles P. Pfleeger, Shari Lawrence Pfleeger - Security in comput	ing – Prentice
	Hall of India.	

	Department of Computer Sc National Institute of Tecl	-	-	
Course Title	Data Mining	Semester		
Department	Computer Science &	Course Code	CST048	
_	Engineering			
Credits	03	L	Т	Р
Course Type	Theory	3	0	0
	Course Objec	ctives		

- To introduce students to the basic concepts and techniques of Data Mining.
- To develop skills of using recent data mining software for solving practical problems.
- To gain experience of doing independent study and research.
- To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

Learning Outcomes

This course has the following program learning outcomes:

- Study the major data mining problems as different types of computational tasks (prediction, classification, clustering, etc.) and the algorithms appropriate for addressing these tasks.
- Learn how to analyze data through statistical and graphical summarization, supervised and unsupervised learning algorithms.
- Systematically evaluate data mining algorithms and understand how to choose algorithms for different analysis tasks.

Course Synopsis

This course introduces basic concepts, tasks, methods, and techniques in data mining. The emphasis is on various data mining problems and their solutions. Students will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Students will also be exposed to a sample of data mining applications.

	Course Outline / Content	
Unit	Topics	Week
2.	Introduction to Data Mining: Introduction: Scope of Data	1
	Mining: What is Data Mining; How does Data Mining Works,	
	Predictive Modelling: Data Mining and Data Warehousing:	
	Architecture for Data Mining: Profitable Applications: Data	
	Mining Tools	
3.	Business Intelligence: Introduction, Business Intelligence,	2
	Business Intelligence tools, Business Intelligence	
	Infrastructure, Business Intelligence Applications, BI versus	
	Data Warehouse, BI versus Data Mining, Future of BI.	
4.	Data Pre-processing: Introduction, Data Pre-processing	2
	Overview, Data Cleaning, Data Integration and	
	Transformation, Data Reduction, Discretization and Concept	
	Hierarchy Generation.	
5.	Data Mining Techniques- An Overview: Introduction, Data	2
	Mining, Data Mining Versus Database Management System,	
	Data Mining Techniques- Association rules, Classification,	
	Regression, Clustering, Neural networks.	

6.	Clustering: Introduction, Clustering, Cluster Analysis, Clustering Methods- K means, Hierarchical clustering, Agglomerative clustering, Divisive clustering, clustering and	1
	segmentation software, evaluating clusters.	
7.	Web Mining: Introduction, Terminologies, Categories of Web	2
	Mining – Web Content Mining, Web Structure Mining, Web	
	Usage Mining, Applications of Web Mining, and Agent based	
	and Data base approaches, Web mining Software.	
8.	Applications of Data mining: Introduction, Business	2
	Applications Using Data Mining- Risk management and	
	targeted marketing, Customer profiles and feature	
	construction, Medical applications (diabetic screening),	
	Scientific Applications using Data Mining, Other	
	Applications.	
	Text Books	
3.	Kamber and Han, "Data Mining Concepts and Techniques", Hart	t Court India P.
	Ltd. Elsevier Publications Second Edition, 2001	
4.	Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wi	iley & Sons,
	2004.	
	References	
5.	W. H. Inmon, "Building the operational data store", 2nd Ed., Joh	n Wiley, 1999.
6.	Pang- Ning Tan, Michael Steinbach, Viach, Vipin Kumar, Introd	uction to Data
	Mining, Pearson	

		Department of Compu National Institute of		0	g	
Course T	itle Ad	vanced Graph Algorithn				
Departm		mputer Science & gineering	Course C	Code	CST049)
Credits	03		L		Т	Р
Course T	vpe The	eory	3		0	0
		-	Objectives			•
pla • To pro Students v • An • An • Er • Sy ke	anarity of a o apply op efix code f who compl rgue the co nalyze wor nploy grap who size n y compone	ete the course will have rrectness of algorithms u st-case running times of hs to model engineering ew graph algorithms an ents, and analyze them.	b construct a mini- ag Outcomes demonstrated the using inductive pro- algorithms using problems, when a d algorithms that	ability to bofs and i asymptoti appropriat employ g	ning tro do the f nvarian ic analy e. raph co	ee of a graph following: ts. sis. omputations as
		ween unterem data sin	ictures. Pick an a	ppropriat	e data s	structure for a
This cour	sign situati	Cours advanced graph algori	e Synopsis thms from variou	ıs fields	. Fast a	algorithms fo
This cour fundamen minimum	sign situati rse covers tal graph spanning	on. Cours advanced graph algori optimization problems trees, nonbipartite mat	e Synopsis thms from variou s, including may tching, planar sep	ıs fields kimum fl	Fast a	algorithms for inimum cuts
This cour fundamen minimum shortest p	sign situati rse covers tal graph spanning	on. Cours advanced graph algori optimization problems trees, nonbipartite mat Course Ou	e Synopsis thms from variou s, including max tching, planar sep atline / Content	ıs fields kimum fl	Fast a	algorithms for inimum cuts lications, and
This cour fundamen	sign situati rse covers tal graph spanning	on. Cours advanced graph algori optimization problems trees, nonbipartite mat	e Synopsis thms from variou s, including max tching, planar sep atline / Content	ıs fields kimum fl	Fast a	algorithms for inimum cuts
This cour fundamen minimum shortest pa Unit 1.	sign situati rse covers tal graph spanning aths. Basics: In Bipartite (Algorithm	on. Cours advanced graph algori optimization problems trees, nonbipartite mat Course Ou Topic troduction, Machine M Graphs, Eulerian Graph , Hierholzer's Algorithm	e Synopsis thms from various, including max tching, planar sep ttline / Content cs lodel, Graph Dat as, Circuits & Tra	us fields kimum fl parators a a Structu ails, Fleu	Fast a low, m und app res, ry's	algorithms for inimum cuts lications, and
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5.	Planar Graphs: Planar Separator Theorem and its Applications, Embeddings (combinatorial + planar), Euler's Formula, Kuratowski's Theorem, Detour to Platonic Solids, Dual Graphs, Interdigitating Trees, Half-Edge Data Structure, Decremental Dynamic Adjacency Queries, Max-Cut in polynomial time, Minimum Spanning Trees in linear time, Shortest Paths with Matrix Multiplication.	3
6.	NP-Hard Problems: Intro (FPT). Vertex Cover: FPT algorithm, Buss' kernel. Feedback Vertex Set: FPT algorithm, Kernels for Vertex Cover by Matching and for Feedback Vertex Set, Hamiltonian Path Problem, k-Path, Chromatic number, FPT Cut Problems: Important separators, Multiway Cut, Treewidth: Tree decompositions, Algorithmic use (dynamic programming), Introduction to Bidimensionality, Planar Graphs: Linear Kernels, Bidimensionality, Subexponential Time Parameterized Algorithms, Problems on Restricted Graph Classes, Combinatorial Algorithms for Linear Fisher Markets	2
	Text Books	
1.	R. Diestel. "Graph Theory". Springer, 2012.	
2.	Kozen, "Design and Analysis of Algorithms". Springer	
	References	
1.	Douglas B. West, Introduction to Graph Theory, Second Edition, F	Prentice-Hall
2.	Bondy, J. A. and Murty, U.S.R., 'Graph Theory with Applications	', Springer

		Department of Computer Scien National Institute of Techno	8 8		
Cours	e Title	Advanced Java	Semester		
	tment	Computer Science & Engineering	Course Code	CST)50
Credi		03	L	$\frac{1}{T}$	<u>P</u>
	e Type	Theory	3	0	0
Court	<u>e rype</u>	Course Objectiv	-	0	Ŭ
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		of the various advanced packages.	knowledge in sava pr	ogrammi	ing and
CAPIOI	e the uses	Learning Outcon	nes		
At the	end of the	course the participant will:			
•		Swing-based GUI			
•	-	client/server applications and TCP/IP	socket programming		
•		nd retrieve the data from the databases			
•		distributed applications using RMI	s using DQL		
•	-	component-based Java software using	IavaReans		
-		server side programs in the form of se			
•	Develop	Course Synopsi			
Collec	tion fram	ework, Multithreading, Networking, 1		IDBC S	orvlote
		ages, Remote Method Invocation	-		
	ecture.	ages, Remote Method Invocation	, common object i	xequest	DIOKC
	ecture.	Course Outline / Co	ontent		
Unit		Topics	,intent		Weel
1.	Collecti	ons: Collection Interfaces, Concrete	Collections The Col	lections	
	Framew				
		reading: Creating thread and ru	unning it. Multiple	Thread	2
		on single object, Synchronization, T			
	-	hread priorities, Daemon Thread, Life			
2.		king: Internet Addressing, InetA	-	ethods,	
		Methods, TCP/IP Client Sockets, U		TCP/IP	
		ockets, Datagrams			3
	Enterpr	ise Java Bean: Preparing a Class t	to be a JavaBean, Cre	eating a	
	JavaBea	n, JavaBean Properties, Types of b	beans, Stateful Sessio	n bean,	
	Stateless	Session bean, Entity bean.			
•	Java D	atabase Connectivity (JDBC):Me	erging Data from M	Iultiple	
3.		Joining, Manipulating Databases wit	h JDBC, Prepared Stat	ements,	
3.	Transact	ion Processing, Stored Procedures C.			
3.			re Interface Servlet a	nd the	3
3.	Servlets	: Servlet Overview and Architectur			
3.	Servlets Servlet	Life Cycle, Handling HTTP get Red	quests, Handling HTT	'P post	
3.	Servlets Servlet Requests	Life Cycle, Handling HTTP get Reas, Redirecting Requests to Other	quests, Handling HTT	'P post	
	Servlets Servlet Requests Cookies	Life Cycle, Handling HTTP get Reas, Redirecting Requests to Other Session Tracking with HttpSession.	quests, Handling HTT Resources, Session T	P post racking,	
3.	Servlets Servlet Requests Cookies JavaSer	Life Cycle, Handling HTTP get Reas, Redirecting Requests to Other Session Tracking with HttpSession. Ver Pages (JSP): Introduction, Jav	quests, Handling HTT Resources, Session T vaServer Pages Overv	P post racking, iew, A	
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	Servlets Servlet Requests Cookies JavaSer First Ja Actions, Remote Impleme	Life Cycle, Handling HTTP get Real s, Redirecting Requests to Other Session Tracking with HttpSession. Ver Pages (JSP): Introduction, Jav waServer Page Example, Implicit Directives, Custom Tag Libraries Method Invocation: Defining enting the Remote Interface, Compi	quests, Handling HTT Resources, Session T vaServer Pages Overv Objects, Scripting, S the Remote In	P post racking, iew, A standard terface,	3
4.	Servlets Servlet Requests Cookies JavaSer First Ja Actions, Remote Impleme and the C	Life Cycle, Handling HTTP get Real s, Redirecting Requests to Other Session Tracking with HttpSession. Ver Pages (JSP): Introduction, Jav avaServer Page Example, Implicit Directives, Custom Tag Libraries Method Invocation: Defining enting the Remote Interface, Compi Client.	quests, Handling HTT Resources, Session T vaServer Pages Overv Objects, Scripting, S the Remote In ling and Executing the	P post racking, iew, A standard terface, e Server	3
	Servlets Servlet Requests Cookies JavaSer First Ja Actions, Remote Implement and the C	Life Cycle, Handling HTTP get Real s, Redirecting Requests to Other Session Tracking with HttpSession. Ver Pages (JSP): Introduction, Jav avaServer Page Example, Implicit Directives, Custom Tag Libraries Method Invocation: Defining enting the Remote Interface, Compi Client.	quests, Handling HTT Resources, Session T vaServer Pages Overv Objects, Scripting, S the Remote In ling and Executing the Architecture (CC	P post racking, iew, A standard terface, e Server DRBA):	3

	Introduction Smart Phone Application Development: Introduction to android platform, Creating application template, adding activity, intent, services to application, receivers and alerts.						
	Text Books						
1.	Core and Advanced Java, Black Book, Dreamtech Press						
2.	Java SE8 for Programmers (3rd Edition) (Deitel Developer Series) by Paul						
	Deitel and Harvey Deitel.						
	References						
1.	"Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S.						
	E. Santry – Prentice Hall						
2.	"Beginning Java [™] EE 6 Platform with GlassFish 3 From Novice to Professional" by						
	Antonio Goncalves– Apress publication.						

		-	-	Science & Engi echnology Srina		g	
Course	Title	Numerical Met		Semester	agai		
Departr		Computer Scier		Course Co	de	MTH 70)7
Depuiru	пепе	Engineering		eouise eou			
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	residual methods – Galerkin's method, collocation method, Functional, quadratic functionals. Numerical Integration – Gauss Legendre, Quadrature, Error Analysis, Convergence of solution. Finite element and Boundary element method.					
Text Books						
1.	S. S. Sastry, 'Numerical Analysis', Prentice-Hall of India Pvt. Ltd.					
2.	M.K. Jain, et.al., 'Numerical Methods for Scientific and Engineering					
	Computation', New Age International Publishers					
	References					
1.	Applied Numerical Methods with MATLAB for Engineers and Scientists,					
	2nd Edition. Stephen C. Chapra, McGraw Hill, 2010					
2.	J. H. Mathews and K. D. Fink, Numerical Methods Using MATLAB®, 3rd ed,					
	Upper Saddle River, NJ: Prentice Hall, 2004, ISBN: 0130652482					
3.	A. Gilat and V. Subramaniam, Numerical Methods for Engineers and Scientists,					
	John Wiley & Sons, Inc., 2008, ISBN: 9780471734406					