STATISTICAL MACHINE LEARNING

II B.Tech: I Sem **L:3 T: P: C:3**

Name of the Instructor(s): DADI RAMESH

No. of Hours/week: 3

Total number of hours planned: 48

Pre-requisite

- Prior courses:

Learning Resources

Required Resources

Name of the Textbook:

1. Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.
2. Hastie, T., Tibshirani, R. and Friedman J., The elements of statistical learning: data mining, inference and prediction (2 ed.), Springer Science & Business Media, 2017. ISBN 978-0387848570.

Reading materials:

1. Adler, J., R in a Nutshell: A Desktop Quick Reference (1 ed.), O'Reilly Media, 2012. ISBN 978-9350239209.
2. Murphy, K., Machine Learning: A Probabilistic Perspective (1 ed.), MIT Press, 2012. ISBN 978-0262018029.
3. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, An introduction to statistical learning: with applications in R (1 ed.), Springer, 2013. ISBN 978-1461471370

Additional Resources (links etc):

How to Contact Instructor:

DADI RAMESH:

- In-person office hours: 9:30 AM to 5:00 PM – Room no.: 1311, except class timings
- Online office hours: 9:30 AM to 5:00 PM - Except class timings, a mail or message
    - Mail: d.ramesh@sru.edu.in
    - Phone numbers:9848142720
- Other than office hours: A message to the above number from 6PM to 9PM from Monday to Saturday and 8AM to 10 AM on Sunday

Technology Requirements: (optional)

- Laptops for class work
- Learning management system (canvas)

Overview of Course:

- What is the course about: its purpose?
  Basics of machine learning
- What are the general topics or focus?
  Machine learning, types of learning, math's behind ML
- How does it fit with other courses in the department or on campus?
  Machine learning, Data Science, Deep learning.
- Why would students want to take this course and learn this material?
  Basics of machine learning,

Methods of instruction

- Lecture (chalk & talk / ICT)
- Collaborative Learning (Think pair share / Jigsaw etc.)

Workload

- Estimated amount of time to spend on course readings,Students are informed to spend half an hour per day (any four days of a week) or maximum of two hours per week on course readings, Estimate amount of time to student needs to spend on course assignments and projects (per week).
- One assignments is given during the delivery of this course. Students will need to spend couple of hours per day for a maximum of three days or one hour per day for a maximum of six days to finish the assignment.

Assessment

S. No		Assessment Methodology	No of assessments	Weightage in marks	Marks scaled to
	CIE	Quizzes	5	5	10
		Slip test	--	--	--
		Assignment	--	--	--
		Course Activity	--	--	--
		Course Project	--	5	10
		Any other method	--		--
		Internal exams	2	20	20
	SEE	--	--	--	60

Note:
Class test:
The class test will be scheduled after completion of each unit with prior intimation to students and the grades will be announced 3 days after the completion of test.
Two assignments will be given each of 5 marks and scaled to total of 5.The students need to submit the assignment in time.
Absentees for class assessments.

The absentees for class assessment will be awarded zero marks unless the reason for absent is prior and a genuine one. In case of genuine reason and have permission from concerned authority, a retest will be conducted with a new set of assessment questions.
In case of assignment full marks will be awarded for those who submit proper assignment in time, late assignments will be marked as zero.

Key concepts: Prediction, classification, supervised, un supervised learning, Regularization, HMM,

Difficult Topics: Regression, HMM, classification, Kernel Smoothing Method, Sparsity.

LESSON PLAN

Course Outcomes (COs):
At the end of the course the student should be able to:

1. Understand key features of Statistical Machine Learning
2. Formulate, design, and implement given application as statistical machine learning problem.
3. Analyze common statistic techniques and evaluate them using relevant metrics.
4. Apply and implement statistic techniques to solve the real-world problems
5. Analyze statistical machine learning tools.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	3												1	
CO2		2	2			2						1	2	
CO3				2	3								1	1
CO4						3		1					2	
CO5					3							3	1	

Course Content (Syllabus)

UNIT – I

Statistical Learning– Introduction, Why Estimate, The Trade-Off Between Prediction Accuracy and Model Interpretability, Supervised Versus Unsupervised Learning, Regression Versus Classification Problems, Statistical real learning problems, variable types, approaches to prediction. statistical decision theory, local methods in high dimensions, Statistical models, supervised learning and function approximation, structured regression models, Model selection and the bias –variance trade-off.

UNIT –II

Linear Methods for Regression- Linear regression models and least squares, subset selection, shrinkage methods, methods using derived input directions, multiple outcome shrinkage and selection, Lasso and related path algorithms.

Linear Methods for Classification- Linear Regression of an Indicator Matrix, Linear Discriminant Analysis, Logistic Regression, Separating Hyperplanes.

UNIT –III

Basis Expansions and Regularization - Piecewise Polynomials and Splines, Filtering and Feature Extraction, Smoothing Splines, Automatic Selection of the Smoothing Parameters, Regularization and Reproducing Kernel Hilbert Spaces, Wavelet Smoothing, Kernel Smoothing Method.

UNIT – IV

Maximum likelihood, Bayes, minimax, parametric versus nonparametric methods, Bayesian versus Non-Bayesian approaches, density estimation.

Convexity and Optimization: Convexity, conjugate functions, unconstrained and constrained optimization, KKT conditions.

UNIT – V

Parametric Methods: generalized linear models, mixture models, classification, graphical models, structured prediction, hidden Markov models.

Sparsity: High dimensional data and the role of sparsity, basis pursuit and the lasso revisited sparsistency, consistency, persistency, greedy algorithms for sparse linear regression, sparsity in nonparametric regression. sparsity in graphical models.

S. No	Topic	Delivery Method/ Activity	Lecture No.
UNIT I			
	Statistical learning– introduction		1
	Why estimate, the trade-off between prediction accuracy and model interpretability,		2
	Supervised versus unsupervised learning		1

	Regression versus classification problems,		1
	Statistical real learning problems		1
	Variable types, approaches to prediction		1
	Statistical decision theory		1
	Local methods in high dimensions, statistical models		1
	Supervised learning and function approximation,		1
	Structured regression models		1
	Model selection and the bias –variance trade-off.		1
UNIT II			
	Linear regression models and least squares		1
	Subset selection, shrinkage methods		2
	Methods using derived input directions		1
	Multiple outcome shrinkage and selection		1
	Lasso and related path algorithms		2
	Linear regression of an indicator matrix		2
	Linear discriminant analysis		1
	Logistic regression, separating hyperplanes		2
UNIT III			
	Piecewise polynomials and splines		1
	Filtering and feature extraction		1
	Smoothing splines		1
	Automatic selection of the smoothing parameters		1
	Regularization and reproducing kernel hilbert spaces		2
	Wavelet smoothing		1
	Kernel smoothing method		2
UNIT IV			
	Maximum likelihood, Bayes		1
	minimax, parametric versus nonparametric methods		1

	Bayesian versus Non-Bayesian approaches, density estimation		1
	Convexity		1
	conjugate functions		1
	unconstrained and constrained optimization,		1
	KKT conditions		1
UNIT V			
	Generalized linear models, mixture models		1
	Classification, graphical models,		1
	Structured prediction		1
	Hidden Markov models		1
	High dimensional data and the role of sparsity		1
	Basis pursuit and the lasso revisited sparsistency,		1
	Consistency, persistency, greedy algorithms for sparse linear regression		2
	Sparsity in nonparametric regression.		1
	Sparsity in graphical models.		1

LINUX PROGRAMMING

II B.Tech: I Sem **L:2 T: J:2 C:3**

Name of the Instructor(s): **Dr. P. Kumaraswamy**

No. of Hours/week: **4**

Total number of hours planned: **56**

Pre-requisite

Nil

Learning Resources

Course notes, Handouts, Textbooks, online courses.

Required Resources

1.Unix System Programming using C++, T. Chan, PHI

2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.

How to Contact Instructor:

In-person office hours: 12:40 pm to 1:20 pm

Online office hours: time and how to access

p.kumaraswamy@sru.edu.in, (Evening 6:00 PM to 7:00 PM)

Phone numbers: 9848309647

Optional: 4:00pm to 5:00pm (Tuesday, Wednesday)

Overview of Course:

This course provides a deep understanding of the operating system architecture and low-level interfaces (principally, system calls and library functions) that are required to build system-level, multithreaded, and network applications on Linux and UNIX systems. The course consists of a mixture of detailed presentations coupled with a large number of carefully designed practical exercises that allow participants to apply the knowledge learned in the presentations.

Methods of instruction

Lecture
Discussion
PPT
Videos

Workload

- Estimated amount of time student needs to spend on course readings (per week): (2 hours)
- Estimate amount of time to student needs to spend on course assignments and projects (per week): (1 hour)

Assessment

Sample 1:

S. No		Assessment Methodology	No of assessments	Weightage in marks	Marks scaled to
	CIE	Quizzes			
		Slip test			
		Assignment	2	5	5
		Course Activity	--		--
		Course Project	2	5	5
		Any other method	--		--
		Internal exams	2	30	30
	SEE	--	--	--	60

Key concepts

Linux Utilities, Files and Directories, Process, Interprocess Communication, Shared Memory

LESSON PLAN

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems.
2. Implement in C some standard Linux utilities such as ls, mv, cp etc. using system calls.
3. Develop the skills necessary for systems programming including file system programming, process and signal management.
4. Analyze various inter process communication methods.
5. Develop the basic skills required to write network programs using Sockets.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2	3	-	2									3	2
CO2	2	3	-	2									2	3
CO3	2	3	-	1									2	3
CO4	2	3	-	3									3	2
CO5	2	3	-	3									2	3

Course Content (Syllabus)

S. No	Topic	Delivery Method/ Activity	Lecture No.
UNIT I			
1	Linux Utilities - File handling utilities	Discussion, PPTs	1
2	Security by file permissions, Process utilities,	Discussion, PPTs	3
3	Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities	Chalk & talk/PPTs	4
4	Sed-Scripts, Operation, Addresses, Commands, Applications, awk-Execution, Fields and Records	Discussion, PPTs	6
5	Scripts, Operation, Patterns, Actions, Associative Arrays	Discussion, PPTs	7
6	String and Mathematical functions, System commands in awk, Applications	Discussion, PPTs	8
7	Shell programming with Bourne again shell (bash) - Introduction, shell responsibilities	Discussion, PPTs	9
8	pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters	Discussion, PPTs	10
9	file name substitution, shell variables, command substitution, shell commands, the environment	Chalk & talk/PPTs	11
10	quoting, test command, control structures, arithmetic in shell, shell script examples	Chalk & talk/PPTs	12
11	interrupt processing, functions, debugging shell scripts.	Chalk & talk/PPTs	12

UNIT II			
12	Files and Directories - File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files	Discussion, PPTs	13
13	System calls for file I/O operations- open, creat, read, write, close, lseek, dup2, file status information-stat family	Discussion, PPTs	15
14	File and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown.	Chalk & talk/PPTs	16
15	fchown, links-soft links and hard links – symlink, link, unlink	Discussion, PPTs	17
16	Directories - Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd	Discussion, PPTs	18
17	Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.	Discussion, PPTs	20
UNIT III			
18	Process – Process concept, Layout of a C program image in main memory	Discussion, PPTs	22
19	Process environment-environment list, environment variables, getenv, setenv, Kernel support for process, process identification	Discussion, PPTs	24
20	Process control - process creation, replacing a process image, waiting for a process, process termination	Chalk & talk/PPTs	26
21	zombie process, orphan process, system call interface for process management	Discussion, PPTs	27
22	Fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal	Discussion, PPTs	28
23	Differences between threads and processes. Signals – Introduction to signals	Chalk & talk/PPTs	29
24	Signal generation and handling, Kernel support for signals, Signal function, unreliable signals	Chalk & talk/PPTs	31
25	reliable signals, kill, raise, alarm, pause, abort, sleep functions	Chalk & talk/PPTs	33
UNIT IV			
26	Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system	Discussion, PPTs	35

27	IPC between processes on different systems, pipes-creation, IPC between related processes using unnamed pipes	Discussion, PPTs	37
28	FIFOs-creation, IPC between unrelated processes using FIFOs (Named pipes),	Chalk & talk/PPTs	39
29	differences between unnamed and named pipes, popen and pclose library functions.	Discussion, PPTs	41
30	Message Queues - Kernel support for messages, APIs for message queues, client/server example.	Discussion, PPTs	43
31	Semaphores - Kernel support for semaphores, APIs for semaphores, file locking with semaphores.	Chalk & talk/PPTs	45
UNIT V			
32	Shared Memory - Kernel support for shared memory, APIs for shared memory, shared memory example	Chalk & talk/PPTs	47
33	Sockets - Introduction to Berkeley Sockets, IPC over a network, Client Server model, Socket address structures	Discussion, PPTs	49
34	Socket system calls for connection oriented protocol and connectionless protocol,	Chalk & talk/PPTs	51
35	example-client/server programs-Single Server-Client connection	Discussion, PPTs	53
36	Multiple simultaneous clients, Socket optionssetsockopt and fcntl system calls,	Discussion, PPTs	55
37	Comparison of IPC mechanisms	Chalk & talk/PPTs	56

Human Computer Interface

II B.Tech/I Sem **L:3 T:_P:2C:4**
Name of the Instructor(s):**K. Ravi Chythanya**and**Veera Reddy**

No. of Hours/week:3

Total number of hours planned:48

Pre-requisite:

1. Introduction to Computers

Learning Resources:

1. Mobiles with Internet Facility for successful completion of Online Quizzes.

Required Resources:

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, ―Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009

Reference Books:

1. Bill Scott and Theresa Neil, ―Designing Web Interfaces, First Edition, O'Reilly, 2009

Reading Resources:

1. Lecture Notes
2. PPTs

Additional Resources:

Web Links:

How to Contact Instructor:

- **In-person office hours**:
  1. K. Ravi Chythanya
     - Students can meet, whenever we have free schedule during the college hours.
- **Online office hours: time and how to access**
  1. K. Ravi Chythanya
     - Email-ID: ravi.chythanya@sru.edu.in
     - Phone number: 9000188956

Technology Requirements:

- Canvasand Kahoot

Methods of instruction

- Lecture (chalk & talk / ICT)
- Collaborative Learning (Role Play, Group Activity)

Workload

- Estimated amount of time student needs to spend on course readings (per week) -3

Assessment

S. No	Assessments	Assessment Methodology	No of assessments	Weightage in marks	Marks scaled to
1	CIE	Quizzes	2	5	5
2		Class test	2	10	5
3		Assignment	2	5	5
4		Course Activity	1	5	5
5		Course Project	--	--	--
6		Internal exams	2	20	20
7	SEE	--	--	--	60

Class test/ Quiz:
Schedule:

Test-Type	Syllabus	Tentative Date&Time	Mode
Class Test-1	1st Unit	3rdWeek-Last Working Hour	Offline
Quiz-1	1st Unit and 2nd Unit	8th Week-Last Working Hour	Online
Quiz-2	3rd Unit and 4th Unit	14th Week-Last Working Hour	Online
Class Test-2	5th Unit	16th Week-Last Working Hour	Offline

- Grades (will be shared immediately if its online and within 3 days from the activity if it is offline)

Grade	Marks Range
Grade 'A'	>=8
Grade 'B'	>=5 and <8
Grade 'C'	>=3 and <5
Grade 'D'	<3

- **Absentees for class assessments:**
  - With HOD permission Re-conduction of the Class Assessment will be done within next two working days from 4:00 PM to 5:00PM, Class Test/Quiz mark is evaluated for 75% of original marks.
  - Students who have taken prior permission from the HOD, re-conduction of the Class Assessment will be done within next two working days from 4:00 PM to 5:00PM Class Test/Quiz mark is evaluated for original marks.

Key concepts:
- Software life cycle,
- Cognitive Models,
- Mobile Applications

Difficult Topics:

- Paradigms,
- Cognitive Models,
- GUI Programming.

LESSON PLAN

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Design effective dialog for HCI
2. Design effective HCI for individuals and persons with disabilities.
3. Assess the importance of user feedback.
4. Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
5. Develop meaningful user interface.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	2											2	1
CO2		3	3	2				2						2
CO3					3	2				2	3			3
CO4			2				3		2			3	2	
CO5		3			3					2			3	

Course Content (Syllabus)

UNIT I

Foundations of HCI

The Human: I/O channels – Memory – Reasoning and problem solving; **The Computer:** Devices – Memory – processing and networks; **Interaction:** Models – frameworks – Ergonomics – styles – elements – interactivity- **Paradigms**. – Case Studies

UNIT II

Design & Software process

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. **HCI in software process:** Software life cycle – usability engineering – Prototyping in practice – design rationale. **Design rules:** principles, standards, guidelines, rules. **Evaluation Techniques** – Universal Design

UNIT III

Models & Theories

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV

Mobile HCI

Mobile Ecosystem: Platforms, Application frameworks- **Types of Mobile Applications:** Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, **Mobile Design:** Elements of Mobile Design, Tools. – Case Studies

UNIT V

Web Interface Design

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies

LESSON PLAN

Lecture No.	Topic	Delivery Method/ Activity
UNIT – I		
L1	Foundations of HCI	Chalk& Talk/ PPT
L2	The Human: I/O channels	Chalk & Talk/ PPT
L3	The Human: I/O channels	Chalk & Talk/PPT
L4	Memory, and Reasoning and problem solving	Chalk & Talk/PPT
L5	The computer: Devices	Chalk & Talk/PPT
L6	Memory,and processing and networks	Chalk & Talk/PPT
L7	Interaction: Models, frameworks	Chalk & Talk/PPT
L8	Ergonomics, styles	Chalk& Talk/PPT
L9	Elements, interactivity	Chalk & Talk/PPT
L10	Paradigms, Case Studies	Chalk & Talk/PPT
UNIT – II		
L11	**Design & Software process -**Interactive Design: Basics	Chalk & Talk/PPT
L12	Process, scenarios	Chalk & Talk/PPT
L13	Navigation, screen design	Chalk & Talk/PPT
L14	Iteration and prototyping	Chalk & Talk/PPT
L15	HCI in software process: Software life cycle	Chalk & Talk/PPT
L16	usability engineering	Chalk & Talk/PPT
L17	Prototyping in practice – design rationale	Chalk & Talk/PPT
L18	Design rules: principles	Chalk & Talk/PPT
L19	standards, guidelines, rules	Chalk & Talk/PPT
L20	Evaluation Techniques – Universal Design	Chalk & Talk/PPT
UNIT – III		
L21	Models & Theories: HCI Models: Cognitive models	Chalk & Talk/PPT
L22	Cognitive modelsSocio-Organizational issues	Chalk & Talk/PPT
L23	Cognitive models	Chalk & Talk/PPT

L24	Socio-Organizational issues	Chalk & Talk/PPT
L25	stakeholder requirements	Chalk & Talk/PPT
L26	Communication and collaboration models	Chalk & Talk/PPT
L27	Hypertext, Multimedia and WWW	Chalk & Talk/PPT
L28	Hypertext, Multimedia and WWW	Chalk & Talk/PPT
UNIT – IV		
L29	Mobile HCI - Mobile Ecosystem: Platforms	Chalk & Talk/PPT
L30	Application frameworks	Chalk & Talk/PPT
L31	Application frameworks	Chalk & Talk/PPT
L32	Types of Mobile Applications: Widgets	Chalk & Talk/PPT
L33	Applications	Chalk & Talk/PPT
L34	Games	Chalk & Talk/PPT
L35	Mobile Information Architecture	Chalk & Talk/PPT
L36	Mobile 2.0	Chalk & Talk/PPT
L37	Mobile Design	Chalk & Talk/PPT
L38	Elements of Mobile Design	Chalk & Talk/PPT
L39	Tools	Chalk & Talk/PPT
L40	Case Studies	Chalk & Talk/PPT
UNIT – V		
L41	Web Interface Design	Chalk & Talk/PPT
L42	Designing Web Interfaces	Chalk & Talk/PPT
L43	Drag & Drop	Chalk & Talk/PPT
L44	Direct Selection	Chalk & Talk/PPT
L45	Contextual Tools	Chalk & Talk/PPT
L46	Overlays, Inlays	Chalk & Talk/PPT
L47	Virtual Pages	Chalk & Talk/PPT
L48	Process Flow – Case Studies	Chalk & Talk/PPT

FUNDAMENTALS OF DATA SCIENCE

II B.Tech: I Sem **L:3 T:- P:2 C:4**

Name of the Instructor: **V.MANOJ KUMAR**

No. of Hours/week: **3**

Total number of hours planned: **50**

Pre-requisite

- Prior courses: **Nil**
- Knowledge/skills needed to succeed in this course: Basics of any programming language.

Learning Resources

- Course material.

Required Resources

Name of the Textbook:
Reading materials: **Course material.**
Additional Resources: **https://www.coursera.org/specializations/introduction-data-science**

How to Contact Instructor:

- In-person office hours: **9:30 to 4:00; Staff room no. 1308**
- Online office hours: **6:00 pm - 7:00 pm; through Canvas**
    - Email address: **v.manojkumar@sru.edu.in**
    - Phone numbers: **9908943941 only for text messages**
    - LMS: **Canvas**
- Optional: **6 pm - 7 pm (canvas)**

Technology Requirements: (optional)

- Laptops for class work
- Software: **python**
- Learning management system: **Canvas**

Overview of Course:

- What is the course about: its purpose?
    - Data Science is to find patterns within data. It uses various statistical techniques to analyze and draw insights from the data. From data extraction, wrangling and pre-processing, a Data Scientist must scrutinize the data thoroughly. Then, he has the responsibility of making predictions from the data. The goal of a Data Scientist is to derive conclusions from the data. Through these conclusions, he is able to assist companies in making smarter business decisions.

- What are the general topics or focus?
  - Data collection and management, Data Visualization.
  - Applocations of Data Science and Data Science ethical issues.

- How does it fit with other courses in the department or on campus?
  - This course is basic for machine learning and deep learning.

- Why would students want to take this course and learn this material?
  - They can easily ananlyze large data which is useful for predict the future business decisions.
  - Placement.

Methods of instruction

- Lecture (ICT) - Online Lecture /Microsoft Teams & PPT.
- Collaborative Learning (Think pair share / Jigsaw etc.)

Workload

- Estimated amount of time student needs to spend on course readings (per week): **1 hour**
- Estimate amount of time to student needs to spend on course assignments and projects (per week): 2 hours

Assessment

S. No	Assessments	Assessment Methodology	No of assessments	Weightage in marks	Marks scaled to
	CIE	Quizzes	2	5	5
		Class test	--	--	--
		Assignment	2	10	5
		Course Activity	--	--	--
		Course Project	--	--	--
		Internal exams	2	30	30
	SEE	--	--	--	60

Note:

- Class test/ Quiz – schedule to be specified
- Grades (will be shared immediately if its online and within 3 days from the activity if it is offline)
- Absentees for class assessments (Define Ground Rules)

Two types of assessments: 1. Assignments

2. Quiz

1. Assignment:

1.1. Assignment-I:

Schedule: Before the I-Internal Examination Syllabus: I-Unit, II-Unit and (first half)III-Unit.

1.2. Assignment-II:

Schedule: Before the II-Internal Examination Syllabus: IV-Unit and V-Unit.

Note: If the students submit the assignment in time then, will be given **2.5 marks**, otherwise **0 marks**, best in anyone assessment.

2. Quiz:

2.1. Quiz-I:

Schedule: Before the I-Internal Examination
Syllabus: I-Unit, II-Unit.

2. 2. Quiz-II:

Schedule: Before the II-Internal Examination
Syllabus: III-Unit, IV-Unit, V-Unit

Note: If the student attempted the quiz, based on the quiz marks, it would be rounded to **2.5 marks**, otherwise **0 marks**. An average of the two quiz marks would be considered for the overall quiz assessment.

Key concepts

- Data Collection and Management
- Exploratory Data analysis
- Data Visualization
- Applications of Data Science
- Ethical issues in Data Science

LESSON PLAN

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Examine Data Science process and its applications.
2. Interpret how data is collected, stored and managed from multiple sources.
3. Understanding of statistics concepts vital for data science.
4. Practice different data visualization techniques.
5. Summarize the recent trends and ethics of data science.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	3	1	3	3	1	2	-	-	2	-	-	2	-
CO2	1	1	2	2	2	-	-	-	-	2	-	-	2	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO4	2	2	3	2	3	-	-	1	-	-	-	-	2	-
CO5	-	1	1	1	3	-	-	3	-	-	-	-	2	-

Course Content (Syllabus)

Lecture No.	Topic	Delivery Method/ Activity
UNIT-I		
1.	Introduction to Data Science	Online ICT & PPT
2, 3.	Data Gathering and Preparation: Data formats, parsing and transformation	Online ICT & PPT
4.	Scalability and real-time issues	Online ICT & PPT
5, 6.	Data science process	Online ICT & PPT
7, 8.	Data science toolkit	Online ICT & PPT
9.	Types of data, Role of Data Scientist	Online ICT & PPT
10.	Example applications	Online ICT & PPT
UNIT-II		
11.	**Data collection and management:** Introduction	Online ICT & PPT
12.	Sources of data	Online ICT & PPT

13.	Data collection and APIs	Online ICT & PPT
14, 15.	Exploring and fixing data	Online ICT & PPT
16,17.	Data storage and management.	Online ICT & PPT
Quiz-I		
UNIT-III		
18.	**Exploratory Data analysis:** Terminology and concepts, Basic Tools	Online ICT & PPT
19, 20.	Introduction to statistics	Online ICT & PPT
21.	Central tendencies and distributions	Online ICT & PPT
22, 23.	Variance, Population &Samples	Online ICT & PPT
24, 25.	Statistical Modeling.	Online ICT & PPT
Assignment-I		
26.	**Data visualization:** Introduction	Online ICT & PPT
27, 28.	Data Visualization techniques and tools	Online ICT & PPT
29, 30.	Data encodings, Retinal variables	Online ICT & PPT
31,32.	Mapping variables to encodings	Online ICT & PPT
33, 34.	Visual encodings	Online ICT & PPT
UNIT-IV		
35.	Applications of Data Science	Online ICT & PPT
36, 37.	Technologies for visualization	Online ICT & PPT
38, 39, 40.	Bokeh (Python)	Online ICT & PPT
41, 42.	recent trends in various data collection and analysis techniques	Online ICT & PPT
43, 44.	various visualization techniques	Online ICT & PPT
45, 46.	application development methods of used in data science	Online ICT & PPT
UNIT-V		
47, 48.	Discussions on privacy, security, ethics, Next- generation data scientists	Online ICT & PPT
49, 50.	application development methods used in data science.	Online ICT & PPT
Quiz-II		
Assignment-II		

DATA STRUCTURES AND ALGORITHMS

II B.Tech: I Sem **L:3 T: P: C:3**

Name of the Instructor(s): Dr. J.Bhavana, Dr. R.Vijaya Prakash,Mr. K.Sudheer Kumar, Mr.Ashok Kumar

No. of Hours/week: 4

Total number of hours planned: 49

Pre-requisite

- C Programming
- Programming Skills

Learning Resources

- Laptops for class work
- C-Software
- Sometimes Mobiles to perform Activities .

Name of the Textbook :

1. Ellis Horowitz, Sartaj Sahani, Dinesh Metha, "Fundamentals of data Structures in C++", Galgotia Publications Pvt. Ltd., ISBN 81-7515-27, 2003.
2. Mark Allen Weiss, "Data structure and algorithm analysis in C++", 2nd Edition, Pearson Education, ISBN 81-2808-670-0.

REFERENCE BOOKS:

1. Herbert Schildt, "C++, The Complete Reference", TMH, 4th Edition, ISBN: 9780070532465.
2. D. Samanta, "Classic Data Structures", Prentice Hall India, ISBN 81-203-1874-9, 2002.

Reading materials :

1. Lecture notes.
2. Online Video links**.**

Additional Resources (links etc)

1. THE ART OF COMPUTER PROGRAMMING (Volume 1 / Fundamental Algorithms), Donald Knuth
2. Introduction to Algorithms, Cormen, Leiserson, Rivestand Stein

How to Contact Instructor:

- **In-person office hours**:

  1. **Dr. J.Bhavana**
     - Students can meet, whenever we have free schedule during the college hours.

  2. **Dr. R.Vijaya Prakash**
     - Students can meet, whenever we have free schedule during the college hours.

  3. **Mr. K. Sudheer Kumar**
     - Students can meet, whenever we have free schedule during the college hours.

  4. **Mr.Ashok Kumar**
     - Students can meet, whenever we have free schedule during the college hours.

- **Online office hours: time and how to access**

  1. **Dr. J.Bhavana**
     - Email-ID : j.bhavana@sru.edu.in
     - Phone numbers: 9866918803
       LMS : 9:00 pm to 10:00pm

  2. **Dr.R.Vijaya Prakash**
     - Email-ID : r.vijayaprakash@sru.edu.in
     - Phone numbers: 995332996
     - LMS : 9:00 pm to 10:00pm

  3. K. Sudheer Kumar:
     - Email-ID: k.sudheerkumar@sru.edu.in
     - Phone numbers: 9908291292

Technology Requirements: (optional)
- Laptops for class work
- C-Software
- Learning management system (Google classroom / Kahoot)

Overview of Course:

- **What is the course about: its purpose?**
    - In our day today life, everything is about data.
    - Yes, we have lots of data to play with, but to do that we need a proper place to store it and use it back.
    - For example, we cannot store water in a bag, we store it in a bottle and we can't put vegetables or eggs in a bottle, we use a bag.
    - Every container is designed to store specific items (here different data types/formats).
    - So teaching data structure helps us to store the data we have in an efficient manner to retrieve it with low cost and less time.
    - After using the efficient data structure, we can extract the information we want or process it for further analysis.

  The course will introduce the problem solving using programs and design of algorithms and their complexity. It will review elementary data structures such as Arrays, Stack, Queues, Linked List, and related algorithms for manipulating the data structures. It will also discuss sorting and searching techniques, and their complexity. We will also briefly explore more advanced data structures such as graphs and graph algorithms, balanced trees, and heaps.

- **What are the general topics or focus?**
    1. Sorting's
    2. Searching's
    3. Stack & Queue using Arrays and Linked List
    4. Trees and Graphs
    5. Hashing

- **How does it fit with other courses in the department or on campus?**

  A good algorithm usually comes together with a set of good data structures that allow the algorithm to manipulate the data efficiently. In this course, we consider the common data structures that are used in various computational problems. We will learn how these data structures are implemented in different programming languages and will practice implementing them in our programming assignments. This will help us to understand what is going on inside a particular built-in implementation of a data structure and what to expect from it. This course helps us to fit its basic concepts to implement in Design of Analysis and Algorithms in evaluating the time complexity.

- **Why would students want to take this course and learn this material?**

    1. Helps the student to improve problem solving skill.
    2. Helps in learning further programming languages.
    3. Helps to develop applications.

4. As it a concept oriented language, students will be able to improve logical thinking.
5. Helps in understanding System Software's like Operating System.

Methods of instruction

- Lecture (chalk & talk / ICT)
- Collaborative Learning (Role Play, Group Activity)
- Few Activities

Workload

- Estimated amount of time student needs to spend on course readings (per week): 2 hours per week

- Estimate amount of time to student needs to spend on course assignments and projects (per week) : 3-4 Hours per week

Assessment

S. No	Assessments	Assessment Methodology	No of assessments	Weightage in marks	Marks scaled to
1	CIE	Quizzes	2	10	5
2		Class test	--	--	--
3		Assignment	2	10	5
4		Course Activity	--	--	--
5		Course Project	--	--	--
6		Internal exams	2	20	30
7	SEE	--	--	--	60

Note:

- Assignments/ Quiz – schedule to be specified

Topic	Activity	Rubrics	UNIT	Schedule
Sorting's	Role Play	NIL	I	3rd Week
Linked List	Online Quiz	10 Questions will be displayed one mark each (10)	III	9th Week
Trees	Online Quiz	10 Questions (10)	IV	12th Week
	Assignments 1	10 Questions will be given one mark each	I and II	4th Week
	Assignments 2	10 Questions will be given one mark each	III and IV	12th Week
Average		Scaled to 5 Marks		

- Since assessment is through online, the results will be displayed to the students immediately.

Absentees for class assessments (Define Ground Rules)

Absentees for Quiz	In case the student is absent then a structured enquiry problem will be given as an assignment with a deadline, in case the assignment is not submitted in time then he/she will given zero marks.

Key concepts:

1. Sorting's
2. Searching's
3. Stack & Queue using Arrays and Linked List
4. Trees and Graphs
5. Hashing

LESSON PLAN

Course Outcomes (COs):
At the end of the course the student should be able to:

1. Ability to define, understand and explain basic concepts of Data Structures.
2. Ability to apply the concepts of Data Structures using Static and Dynamic Memory Allocation for solving real time problems
3. Ability to Analyse the performance of various Data Structures
4. Ability to choose an effective documentation on data structures.
5. Ability to Develop and Submit a report on real world problems.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
Ability to define, understand and explain basic concepts of Data Structures	3	3	2	-	1	3	-	1	2	-	2	3	3	-

Ability to apply the concepts of Data Structures using Static and Dynamic Memory Allocation for solving real time problems	3	3	2	-	1	3	-	1	2	-	2	3	3	-
Ability to Analyse the performance of various Data Structures	3	3	2	-	1	3	-	1	2	-	2	3	3	-
Ability to choose an effective documentation on data structures	3	3	2	-	1	3	-	1	2	-	2	3	3	2
Ability to Develop and Submit a report on real world problems.	3	3	2	-	1	3	-	1	2	-	2	3	3	-

Course Content (Syllabus)

UNIT- I

Basic concepts - Data types, Abstract Data Types, Data structures, Algorithms.
Searching- Linear Search, Binary Search
Sorting- Bubble Sort, Insertion Sort, Selection Sort, Quick sort, Merge sort, Comparison of Sorting methods.

UNIT- II

Stack ADT - Definitions, operations, array and linked implementations, applications-infix to postfix conversion, recursion implementation,

Queue ADT - Definitions and operations, array and linked Implementations, Applications of Queue Circular queues and operations

UNIT-III

Linear data structures - Linear Lists, Sequential and Linked allocation ,The list ADT, array and linked Implementations, Singly Linked Lists-Operations-Insertion, Deletion, Doubly Linked Lists-Operations - Insertion, Deletion

UNIT- IV

Non Linear data structures: Trees – Basic Terminology, Binary tree ADT, array and linked representations, traversals, threaded binary trees, Disjoint Sets, Union and Find algorithms, Priority Queues-Definition, ADT, Realizing a Priority Queue using Heap.

Search Trees-Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion and Deletion, **AVL Trees** - Definition, Operations – Insertion and Searching,

B-Trees - Definition, B-Tree of order m, operations - insertion and deletion, Introduction to Red-Black and Splay Trees, Comparison of Search Trees.

UNIT -V

Graphs – Introduction, Basic Terminology, Graph Representations- Adjacency matrix, Adjacency lists, Adjacency multilists, Graph traversals- DFS and BFS, Spanning Trees – Kruskals, prims algorithms.

UNIT- VI

Hashing - hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

TEXT BOOKS

1. Mark Allen Weiss, "Data structures and Algorithm Analysis", 3rd edition, Pearson Education. Ltd.,
2. S.Sahani, "Data structures, Algorithms and Applications", Universities Press.

REFERENCE BOOKS

1. Michael T.Goodrich, R.Tamassia and D.Mount, "Data structures and Algorithms", Wiley student edition, seventh edition, John Wiley and Sons.
2. Adam Drozdek, "Data structures and algorithms", 3rd Edition, Cengage Learning.
3. Langsam, Augenstein and Tanenbaum, "Data structures using C", PHI.
4. G.L.Heileman, "Data structures, algorithms and OOP", TMH edition

LESSON PLAN

S.No.	Topic	Delivery Method/ Activity
	UNIT – I	
1	Introduction, Bubble Sort	Chalk & PPT
2	Sorting: Insertion sort	Chalk & PPT
3	Quick sort	Chalk & PPT
4	Merge sort	Role Play Activity & PPT
5	Selection Sort	Chalk & PPT
6	Linear Searching	Chalk & PPT
7	Binary Searching	Chalk & PPT
8	**Activity : Comparison of Sorting Techniques using a Role Play**	Activity through Role Play
	UNIT – II	
9	**Data structures:** Definition, Types, Abstract Data Type(ADT)	Chalk & PPT
10	**Stack**: Model, Representation using arrays	Chalk & PPT
11	Queue Types: Linear	Chalk & PPT
12	Circular Queue	Chalk & PPT
13	DeQueue - Model, Representation using arrays	Chalk & PPT
14	Operations, Applications	Chalk & PPT
	UNIT – III	
15.	Linked List Introduction	Chalk and PPT
16.	Singly Linked Lists -Operations-Insertion, Deletion,	Chalk and PPT
17.	Double Linked Lists -Operations-Insertion, Deletion	Chalk and PPT
18.	Circular Singly Linked Lists -Operations-Insertion, Deletion	Chalk and PPT

19.	Circular Double Linked Lists -Operations-Insertion, Deletion	Group Activity through distribution of Problems to different groups
20.	Traversals	Chalk and PPT
21.	Stack implementation using pointers	Chalk and PPT
22.	Queue implementation using pointers	Chalk and PPT
23.	**Activity**	**Online Quiz Using Kahoot APP (On I & II Units)**
I Mid Examination		
UNIT – IV		
24.	**Non Linear Data Structures-** Trees – Basic Terminology	Chalk and PPT
25.	Binary tree	Chalk and PPT
26.	Binary search tree	Chalk and PPT
27.	Representation, creation	Chalk and PPT
28.	insertion and deletion operations, traversals	Chalk and PPT
29.	Balanced Trees: AVL	Chalk and PPT
30.	Balanced Trees: AVL	Chalk and PPT
31.	B-Trees – representation, Creation, insertion and deletion operations, traversals	Chalk and PPT
32.	RedBlack Tree, Creation, insertion and deletion operations, traversals	Chalk and PPT
33.	Splay Tree, Creation, insertion and deletion operations, traversals	Chalk and PPT
34.	**Activity**	**Online Quiz Using Kahoot APP**
UNIT V		
35	**Non Linear Data Structures,** Graphs: Basic Terminology	Chalk and PPT
36	graph representation &Implementation	Chalk and PPT
37	Graph Traversals: Depth first search Introduction and Program Logic	Chalk and PPT
38	Graph Traversals: Breadth first search Introduction and Program Logic	Chalk and PPT
39	Graph Traversals: Comparison of Depth first search & Breadth first search	Chalk and PPT
40	Minimum cost spanning tree Introduction	Chalk and PPT

41	Prim's algorithms.	Chalk and PPT
42	Minimum cost spanning trees, Kruskal's algorithms.	Chalk and PPT
UNIT-VI		
44	Hashing: Hash functions & methods	Chalk and PPT
45	Implementation of folding method	Chalk and PPT
46	Probing: quadratic probing,	Chalk and PPT
47	Double hashing	Chalk and PPT
48	Collision resolution	Chalk and PPT
49	Application of Data Structures in Computer Science and Engineering	Activity: Discussion
	II – Mid Examinations	

COVER PAGE

Discrete Mathematical Structures (Course Code)

II B.Tech:ISem **L: 3 T: 1 P: 0 C:**

Name of the Instructor(s): NagendarYamsani, P. Anil Kishan, P. Chakradhar, S. Shiva Prasad

No. of Hours/week: 4

Total number of hours planned:64

Pre-requisite

- Prior courses: Nil
- Knowledge/skills needed to succeed in this course: Basic Mathematics

Learning Resources

- Textbooks
- Class Notes
- Good practicing
- Sometimes Mobiles required for active learning practices

Required Resources
Name of the Textbook :

1. Seymour Lipschutz, Lipson Marc, "Discrete Mathematics", Tata Mcgraw Hill, ISBN-100070669120
2. Trembly J.P. and Manohar .P, "Discrete Mathematical Structures with Applications to computer Science", TMH,ISBN-10: 0074631136.

REFERENCE BOOKS:

1. Ralph. P.Grimaldi "Discrete and Combinational Mathematics- An Applied Introduction", 5th Edition Pearson Education,ISBN:9780201726343
2. BernandKolman, Roberty C. Busby, Sharn Cutter Ross, "Discrete Mathematical Structures", Pearson Education / PHI.
3. J.L. Mott, A. Kandel, T.P. "Discrete Mathematics for Computer Scientists and Mathematicians", Baker Prentice Hall..

Reading materials :

1. Lecture Notes soft copy will be provided to the students.
2. Online Video links will be provided**.**

Additional Resources (links etc)

1. Seymour Lipschutz, Marc Lipson, "Discrete Mathematics" – 3rdSchaum'sOutlines,ISBN: 978-0071470384
2. http://www.math.northwestern.edu/~mlerma/courses/cs310-05s/
3. http://highered.mheducation.com/sites/0073383090/student_view0/applications_of_discrete_mathematics.html
4. http://www.mhhe.com/math/advmath/rosen/r5/student/ch01/weblinks.html

How to Contact Instructor:

- **In-person office hours**: (Commonly for all instructors)
    - Students can meet, whenever we have free schedule during the college hours. Specifically on working Wednesday and Saturday during 3 p.m. to 4 p.m.
    - Can meet 4:00 pm to 5:00 pm in working college hours with prior approval.

- **Online office hours: time and how to access**
    - **Instructor: *NagendarYamsani***
        - Email-ID : nagendar.y@sru.edu.in
        - Phone numbers: 9866572973
        - LMS : 9:00 pm to 11:00pm

    - **Instructor: *P. Anil Kishan***
        - Email-ID : p.anilkishan@sru.edu.in
        - Phone numbers: 9390832446
        - LMS : 7:00 pm to 8:00pm

    - **Instructor: *P. Chakradhar***
        - Email-ID : p.chakradhar@sru.edu.in
        - Phone numbers: 9866297033
        - LMS : 6:00 pm to 7:00pm

    - **Instructor: *S. Shiva Prasad***
        - Email-ID : s.shivaprasad@sru.edu.in
        - Phone numbers: 9502390514
        - LMS : 6:00 pm to 7:00pm

Technology Requirements: (optional)

- Learning management system (Google classroom), Canvas

Overview of Course:

- **What is the course about: its purpose?**
  - Discrete math is essential to college-level mathematics and beyond
  - Discrete math is the mathematics of computing
  - Discrete math is very much "real world" mathematics
  - Discrete math teaches mathematical reasoning and proof techniques. Other middle and high schools prefer an "integrated" curriculum, wherein elements of algebra, geometry, and trigonometry are mixed together over a three- or four-year sequence. However, both of these approaches generally lack a great deal of emphasis on **discrete math**: topics such as combinatorics, probability, number theory, set theory, logic, algorithms, and graph theory
- **What are the general topics or focus?**
  - Rules of inference
  - Hasse Diagrams of Partially Ordered Sets and Lattices
  - Techniques of Counting
  - Solving recurrence relation
  - Trees and Graphs
- **How does it fit with other courses in the department or on campus?**
  This is a branch of mathematics that is mainly concerned with the uses of sets and integers, both of which are 'discrete', separate objects from one another. The phrase was coined in the 1980s as a catch-all for math topics that were useful for computer science students, and has evolved into a study on how to think about problem solving in the real world using mathematical (and therefore computational) models. Discrete math is a broad term, but it was defined as a way to group the most important topics in math for needed for computer science like in DBMS, CO, CN and programming. The more exposure a student has to these topics, the better they will be able to handle the challenges of software engineering.

- **Why would students want to take this course and learn this material?**
  - Helps the student to how to construct truth tables and tell the falsehood and truthfulness of a compound statements
  - Helps in learning fundamentals of Set Theory, equivalence relations and equivalence classes.
  - Helps to develop applications.
  - As it a concept oriented language, students will be able to improve logical thinking.
  - Helps in understanding the concepts in various subjects like Operating System, CO, CN, DBMS

Methods of instruction

- Lecture (chalk & talk / ICT)
- Collaborative Learning (Think pair share / Jigsaw etc.)
- Field work/ Group work
- Other methods

Workload

- **Estimated amount of time to spend on course readings** : 4 hours per week
- **Estimate amount of time to spend on course assignments and projects** : 2-3 Hours per week

Assessment

S. No	Assessments	Assessment Methodology	No of Assessments	Weightage in marks	Marks scaled to
	CIE	Quizzes	2	5	5
		Class test	2	5	5
		Assignment	5	5	10
		Course Activity	--	--	--
		Course Project	--	--	--
		Internal exams	2	20	20
	SEE	--	--	--	60

Note:

- Class test/ Quiz – schedule to be specified

Topic	Activity	Rubrics	UNIT	Schedule
Mathematical Logic	Concept Test	10 Questions will be displayed one mark each	I	3rd week
Set Theory & Relations	Online Assessment	Summary of the topic with Multiple Choice Questions (With wrong answers) and later with the discussion related to wrong answers.	II	6th week
Ordered Sets & Functions:	Online Assessment	Summary of the topic with Multiple Choice Questions (With wrong answers) and later with the discussion related to wrong answers.	II	8th week
Techniques of Counting	Think Pair Share Activity	Procedure (5) | Result (5) | Total (10)	III	11th week
Recurrence Relation	Group Activity	Procedure (5) | Result (5) | Total (10)	IV	13th week
Graph Theory	Online Assessment & Group Activity	MCQa for Online Assessment – 10 M Problem Solving for Group Activity – 10 M	V	15th/16th week

- Grades (will be shared immediately if its online and within 3 days from the activity if it is offline)
- **Absentees for class assessments** (Define Ground Rules)

In-time Assignments	10 marks
Late assignment within 5 days	8 Marks
Late Assignments even after	New set of questions will be given (with

5 days	highest marks as 6)

Note (for faculty)

- *In case of a course having a lab, course project can be given due weightage in lab marks.*
- *In case of any deviation from the number of quizzes or class tests, the faculty need to take an approval from the HoD and dean Academics.*

Key concepts

Truth Tables, Sets, Relations, Functions, Permutations, Combinations, Representation of Graph and its basic Concepts

Optional: Pre Assessment Test – Review of the student's standard

LESSON PLAN

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Apply the mathematical logic, predicate rules to design an abstract system for theorem proof.
2. Apply mathematical foundations, algorithmic principles in modeling and design in computer based system.
3. Understand sets, relations, functions, connectives, truth tables, and discrete structures..
4. Apply the concepts of graph theory in solving practical engineering problems.
5. Develop the ability to solve problems involving recurrence relations and generating functions

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
Apply the mathematical logic, predicate rules to design an abstract system for theorem proof	3	3			2								-	2
Apply mathematical foundations, algorithmic principles in modeling and design in computer based system	3	3	1										2	-
Understand sets, relations, functions, connectives, truth tables, and discrete structures	3	2	2										-	3
Apply the concepts of graph theory in solving practical engineering problems	3	3	2		3								2	2
Develop the ability to solve problems involving recurrence relations and generating functions	3	2	1		2								-	2

Course Content (Syllabus)

UNIT I

Mathematical Logic

Statements and notations, Connectives, Well formed formulas, Truth Tables, tautology, equivalence implication, Normal forms.

Predicates

Predicative logic, Free and Bound variables, Rules of inference, Consistency, proof of contradiction.

UNIT II

Set Theory

Introduction, Sets and Elements, Subsets, Venn Diagrams, Set Operations, Power Sets, Partitions

Relations

Introduction, Product Sets, Relations, Pictorial Representatives of Relations, Composition of Relations, Types of Relations, Closure Properties, Equivalence Relations, compatibility and Partial Ordering Relations

Ordered Sets

Ordered Sets, Hasse Diagrams of Partially Ordered Sets, Supremum and Infimum, Isomorphic (Similar) Ordered Sets, Well-Ordered Sets, Lattices and its Properties

Functions: Introduction, Functions, One-to-One, Onto and Bijective Functions, Invertible Functions, Recursive Functions.

UNIT III

Techniques of Counting

Introduction, Basic Counting Principles, Permutations, Combinations, The Pigeonhole Principle and its applications, The Inclusion–Exclusion Principle, Combinations with Repetitions, Binomial and Multinomial Theorems

UNIT IV

Recurrence Relation

Generating Functions, Function of Sequences Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating functions.

UNIT V

Graph Theory

Representation of Graph, Basic Concepts, Basic types of Graphs and their properties, types of paths, Isomorphism and Sub graphs, Multi graphs, Euler circuits, Hamiltonian graphs, Chromatic Numbers, DFS, BFS, Trees, Spanning Trees, Planar Graph, Prim's and Kruskal's Shortest Path

TEXT BOOKS

1. Seymour Lipschutz, Lipson Marc, "Discrete Mathematics", Tata Mcgraw Hill, ISBN-100070669120
2. Trembly J.P. and Manohar .P, "Discrete Mathematical Structures with Applications to computer Science", TMH,ISBN-10: 0074631136

REFERENCE BOOKS

1. Ralph. P.Grimaldi "Discrete and Combinational Mathematics- An Applied Introduction", 5th Edition Pearson Education,ISBN:9780201726343
2. BernandKolman, Roberty C. Busby, Sharn Cutter Ross, "Discrete Mathematical Structures", Pearson Education / PHI.
3. J.L. Mott, A. Kandel, T.P. "Discrete Mathematics for Computer Scientists and Mathematicians", Baker Prentice Hall.

LESSON PLAN

Lecture No.	Topic	Delivery Method/ Activity
	UNIT – I Mathematical Logic & Predicates :	
L1 & L2	Statements and notations	Chalk &Talk
L3 & L4	Connectives	Chalk & Talk
L5 & L6	Well formed formulas, Truth tables	Chalk & Talk
L7	Tautology	Chalk & Talk
L8	Equivalence implication	Chalk & Talk
L9	Normal Forms	Chalk & Talk
L10	Predicative logic	Chalk & Talk
L11	Free& Bound variables	Chalk & Talk
L12 & L13	Rules of interference	Chalk & Talk
L14 & L15	Consistency, Proof of contradiction	Chalk & Talk
	UNIT – II Set Theory, Relations, Ordered Sets &Functions:	
L16	Introduction, SetsandElements, Subsets	Chalk & Talk
L17	Venn Diagrams, SetOperations	Chalk &PPT
L18	PowerSets,Partitions	Chalk & Talk
L19	Relations Introduction,ProductSets	Chalk & Talk
L20 & L21	Relations,PictorialRepresentativesof Relations, Composition ofRelations	Chalk & Talk
L22 & L23	TypesofRelations, Closure Properties, Equivalence Relations, compatibility	Chalk & Talk
L24 & L25	PartialOrderingRelations	Chalk & Talk
L26 & L27	Ordered Sets, HasseDiagrams of Partially Ordered Sets	Chalk &Talk
L28	SupremumandInfimum	Chalk & Talk
L29	Isomorphic(Similar)OrderedSets,Well-OrderedSets	Chalk & Talk
L30	LatticesanditsProperties	Chalk & Talk
L31	Functions Introduction, Functions, One-to-One,	Chalk & Talk

	OntoandBijectiveFunctions	
L32	Invertible Functions,RecursiveFunctions	Chalk & Talk
	Unit - III Techniques of Counting:	
L33	Introduction,BasicCountingPrinciples	Chalk & Talk
L34	Permutations	Chalk & Talk
L35 &36	Combinations	Chalk & Talk
L37& L38	ThePigeonholePrincipleand its applications,TheInclusion–Exclusion Principle	Chalk & Talk Think Pair Share Activity
L39 & L40	CombinationswithRepetitions	Chalk & Talk
L41	BinomialandMultinomialTheorems	Chalk & Talk
	UNIT-IV Recurrence Relation:	
L42 & L43	Generating Functions, Function of sequences	Chalk & Talk
L44	Calculating Coefficient of generating function	Chalk & Talk
L45& L46	Recurrence relations	Chalk & Talk
L47 & L48	Solving recurrence relation by substitution and Generating functions	Chalk & Talk Group Activity
	UNIT – V Graph Theory :	
L49	Representation of Graphs, BasicConcepts	Chalk &PPT
L50	BasictypesofGraphsandtheir Properties	Chalk &PPT
L51 & L52	Isomorphism and Sub graphs, Multi graphs	Chalk &PPT
L53	Euler circuits	Chalk & Talk
L54	Hamiltonian graphs	Chalk & Talk
L55	ChromaticNumbers	Chalk & Talk
L56 & L57	DFS,BFS	Chalk &PPT
L58 & L60	Trees,SpanningTrees	Chalk & Talk
L61 & L62	Planar Graph	Chalk & Talk
L63 & L64	Prim’sand Kruskal’sShortestPath	Chalk &PPT Group Activity

Course Plan

COMPUTER ORGANIZATION

&

ARCHITECTURE

Computer Organization & Architecture (CS 106)

II B.Tech: ISem **L:3 T: P: C:**

Name of the Instructor(s): Mr. Md. Sallauddin, Mr. G. Sunil, Mr. R. Ravi Kumar

No. of Hours/week:3

Total number of hours planned:48

Pre-requisite

- Logic or algebra / Boolean Algebra
- Fundamentals of Number systems
- Basic parts & Functional units of computer.

Learning Resources

- Course notes, Textbooks

Required Resources

Text Books

1. M. Morris Mano, "Computer System Architecture", 3rd Edition, PHI / Pearson, 2006
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization", Fifth Edition, McGraw Hill, 2002

Reference Books

1. William Stallings, "Computer Organization and Architecture", 7th Edition, PHI / Pearson, 2006
2. David A Patterson, "Computer Architecture and Organization", TMH

Additional Resources (links etc)

1. http://nptel.iitm.ac.in
2. http://computerscience.jbpub.com/ecoa/2e/student_resources.cfm
3. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

4. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/

Reading materials:

Online Video links

How to Contact Instructor:

- **In-person office hours**: (Commonly for all instructors)
    - Students can meet, whenever we have free schedule during the college hours. Specifically on working Wednesday and Saturday during 3 p.m. to 4 p.m.
    - Can meet 4:00 pm to 5:00 pm in working college hours with prior approval.

Technology Requirements:

- Learning management system (Google classroom, Kahoot , Google Forms etc.)

Overview of Course:

- **What is the course about: its purpose?**

Computer Organization & Architecture course provides the knowledge of digital logic circuit designsand constructionof integrated memory cells. This course also covers the concepts of integrated circuit enabling with micro-operations and data transfer among the computer components .From this course students can also understand the concepts of memory organization, modes of transfer ,pipelining ,computer arithmetic and bus transfer.

- **What are the general topics or focus?**
    1. Digital logic Circuits
    2. Number system
    3. Register transfer and micro operations
    4. Basic Computer Organization and Design
    5. Computer Arithmetic
    6. Input-Output Organization
    7. Pipelining
    8. Memory Organization

- **How does it fit with other courses in the department or on campus?**
  Computer Architecture & Organization is inter related to many courses in the Computer Science.This course provides the fundamentals of Operating Systems and Network Programming and Distributed Systems.Some topics of Compiler Design, C ,Java and other Programming Languages also based onComputer Architecture & Organization course. This course is core for all Computer Science platforms .
- **Why would students want to take this course and learn this material?**
  1. Helps the student to improve problem solving skill.
  2. Helps in learning of Digital logic Circuit designs .
  3. Understand the concepts of integrated chips control with micro-operations.
  4. Analyze the data transfer among the peripheral devices of computer .
  5. As it a logical oriented, students will be able to improve logical thinking

Methods of instruction

- Lecture (chalk & talk / PPT)

Workload

- Estimated amount of time student needs to spend on course readings (per week): 2 hours per week
- Estimate amount of time to student needs to spend on Homework for practicing the problems (per week) : 2 Hours per week

Assessment

S. No	Assessments	Assessment Methodology	No of assessments	Weightage in marks	Marks scaled to
1	**CIE**	Quizzes	5	5	10
2		Class test	2	2.5	
3		Assignment	2	2.5	
4		Course Activity	--	--	--

6		Internal exams	2	20	30
7	**SEE**	--	--	--	60

Note:

- **Quiz– schedule:**

Topic	**Activity**	**Rubrics**	**UNIT**	**Schedule**
Summary of questions will be framed for each unit	Online Quiz	10 Questions will be displayed one mark each (10)	All Units	After the completion of each unit
Average		Scaled to 5 Marks		

- Class test/ Quiz – The marks allotted for quiz will be graded to assignment
- Since the assessment is through online the results will be displayed to the students immediately.

// Absentees for Quiz

Absentees for Quiz	In case the student is absent then a set of problems will be given to execute using a code as an assignment with a deadline, in case the assignment is not submitted in time then he/she will given zero marks

- **Class test/ Assignment – schedule:**

Topic	**Activity**	**Rubrics**	**UNIT**	**Schedule**
Digital Logic circuits, Data Representation	Assignment	10 Questions will be given one mark each	I& II	4th week
Summary of questions will be	Class test	5 Questions will be given one mark each	Mid I Syllabus	8th week

framed for mid1 syllabus				
Computer Arithmetic, Input Output Organization, Modes of transfer & Pipelining	Assignment	10 Questions will be given one mark each	IV& V	12th week
Summary of questions will be framed for mid2 syllabus	Class test	5 Questions will be given one mark each	Mid II Syllabus	16th week

//Absentees for class assessments

In-time Assignments	5 marks
Late assignment within 5 days	4 Marks
Late Assignments even after 5 days	New set of questions will be given (with highest marks as 3). In case the assignment is not submitted in time then he / she will given zero marks

- Since the assessment is through online the results will be displayed to the students immediately.
-

Key concepts:

1. Digital logic Circuits
2. Register transfer and micro operations
3. Basic Computer Organization and Design
4. Input-Output Organization
5. Pipelining

6. Memory Organization

LESSON PLAN

Course Outcomes (COs):

At the end of the course the student should be able to:

1. Design logical circuits by minimizing logic expression
2. Exemplify arithmetic operations, register transfer language using micro operations & Processor organization
3. Distinguish hardwired and micro programmed control unit in Computer Organization
4. Illustrate I/O organization, modes of transfer and pipelining
5. Comprehend memory organization and hierarchy

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	3	3	3	3	2							2	3	3
CO2	3	3							2		2	2	3	
CO3	3	3	3				1					2	3	
CO4	3	2	1	1								2	3	
CO5	3	1										2	1	

Course Syllabus

UNIT I

Basic Structure of Computers: Functional units, Basic operational concepts

Digital Logic Circuits: Logic Gates, Boolean Algebra, Basic Map simplifications, Combinational Circuits –Decoders, Multiplexers, Sequential Circuits – Flip-flops, Registers.

UNIT II

Data Representation: Data Types, Complements, Fixed Point Representation, Floating Point Representation.

Register Transfer and Microoperations: Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit.

UNIT III

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle.

Central Processing Unit: Register Organization, Instruction Formats, Addressing Modes.

UNIT IV

Computer Arithmetic: Addition, Subtraction, Multiplication and Division Algorithm.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer.

Modes of Transfer: Priority Interrupt, Direct Memory Access.

UNIT V

Pipelining: Arithmetic pipeline, Instruction pipeline, RISC Pipelining.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

TEXT BOOKS:

1. M. Morris Mano, "Computer System Architecture", 3rd Edition, PHI / Pearson, 2006
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization", FifthEdition,McGraw Hill, 2002

REFERENCE BOOKS

1. William Stallings, "Computer Organization and Architecture", 7th Edition, PHI / Pearson, 2006
2. David A Patterson, "Computer Architecture and Organization", TMH

WEB LINKS

1. http://nptel.iitm.ac.in
2. http://computerscience.jbpub.com/ecoa/2e/student_resources.cfm
3. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
4. https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/

Lecture No.	Topic	Delivery Method/ Activity
UNIT – I Basic Structure of Computers & Digital Logic Circuits		
L1	Introduction & Functional units	PPT
L2	Basic operational concepts	PPT
L3	Digital Logic Circuits: Logic Gates	**Think-Pair-Share**
L4	Boolean algebra	**Think-Aloud Pair Problem Solving**
L5,L6	Basic Map simplifications	Chalk & Talk
L7	Combinational Circuits	Chalk & Talk
L8	Decoders	Chalk & Talk
L9	Multiplexers	Chalk & Talk
L10, L11	Sequential Circuits- Flip-flops	Chalk & Talk

L12	Registers	Chalk & Talk
UNIT – II Data Representation, Register Transfer and Micro operations		
L13, L14	Data Types, Complements	Chalk & Talk
L15	Fixed Point Representation	Chalk & Talk
L16	Floating Point Representation	Chalk & Talk
L17	Register Transfer, Bus and Memory Transfers	Chalk & Talk
L18	Arithmetic Micro operations	Chalk & Talk
L19	Logic Micro operations	Chalk & Talk
L20	Shift Micro operations	Chalk & Talk
L21	Arithmetic Logic Shift Unit	Chalk & Talk
UNIT – III Basic Computer Organization and Design, Central Processing Unit		
L22	Instruction Codes	PPT
L23,L24	Computer Registers, Computer Instructions	PPT
L25	Timing and Control, Instruction Cycle	PPT
L26	Register Organization, Instruction Formats	PPT
L27	Addressing Modes	PPT
UNIT – IV Computer Arithmetic, Input-Output Organization and Modes of Transfer		
L28, L29	Addition, Subtraction	Chalk & Talk
L30, L31	Multiplication	Chalk & Talk
L32, L33	Division Algorithm	Chalk & Talk
L34,L35	Peripheral Devices, Input-Output Interface	PPT

L36	Asynchronous Data Transfer	PPT
L37	Priority Interrupt	PPT
L38,L39	Direct Memory Access	PPT
UNIT-V Modes of Transfer, Pipelining and Memory Organization		
L40	Arithmetic pipeline	PPT
L41	Instruction pipeline	PPT
L42	RISC Pipelining	PPT
L43, L44	Memory Hierarchy, Main Memory	PPT
L45	Auxiliary Memory, Associative Memory	PPT
L46	Cache Memory	PPT
L47	Virtual Memory	PPT
L48	Memory Management Hardware	PPT
	Quiz : Quiz will be conducted for all units through Google classroom / Google forms	