ANNEXURE-I
LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2021-22)
B.E. I-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
MC: Three Week Induction Programme											
Theory Course											
1	U21CH102	MC	Environmental Sciences	2	-	-	2	40	60	3	-
2	U21EN103	MC	Essence of Indian Traditional Knowledge	2	-	-	2	40	60	3	-
3	U21MA101	BSC	Mathematics-I	3	1	-	4	40	60	3	4
4	U21PH101	BSC	Engineering Physics	3	1	-	4	40	60	3	4
5	U21CS101	ESC	Programming for Problem Solving	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
6	U21PH1L1	BSC	Engineering Physics Lab	-	-	3	3	25	50	3	1.5
7	U21CS1L1	ESC	Programming for Problem Solving Lab	-	-	4	4	25	50	3	2
8	U21ME1L1	ESC	Engineering Graphics & Design Practice	1	-	4	5	50	50	3	3
Total				14	02	11	27	300	450	--	**17.5**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* ***P*:** Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
MC: Mandatory Course **BSC**: Basic Science Courses **ESC**: Engineering Science Courses
HS: Humanities and Social Sciences **MA**: Mathematics **CH**: Chemistry
EN: English **PH:** Physics **CS:** Computer science
ME: Mechanical Engineering. **EE:** Electrical Engineering

Note:
1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2021-22)
B.E. II-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21EN202	MC	Indian constitution	2	-	-	2	40	60	3	-
2	U21MA201	BSC	Mathematics-II	3	1	-	4	40	60	3	4
3	U21CH201	BSC	Engineering Chemistry	3	1	-	4	40	60	3	4
4	U21EE201	ESC	Basic Electrical Engineering	3	-	-	3	40	60	3	3
5	U21EN201	HSMC	English for Professional Communication	2	-	-	2	40	60	3	2
Practical/ Laboratory Course											
6	U21CH2L1	BSC	Engineering Chemistry Lab	-	-	3	3	25	50	3	1.5
7	U21EE2L1	ESC	Basic Electrical Engineering Lab	-	-	3	3	25	50	3	1.5
8	U21EN2L1	HSMC	Effective Communication and Soft Skills Lab	-	-	3	3	25	50	3	1.5
9	U21ME2L2	ESC	Engineering & IT Workshop	1	-	4	5	50	50	3	3
Total				**14**	**02**	**13**	**29**	**325**	**500**	**--**	**19.5**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination **MC**: Mandatory Course
BSC: Basic Science Course **ESC**: Engineering Science Course
HSMC: Humanities and Social Science Including Management course **MA**: Mathematics
CH: Chemistry **EN:** English **ME**: Mechanical Engineering. **EE:** Electrical Engineering

Note:

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SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2022-23)
B.E. III-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21EC304	ESC	Digital Electronics and Computer Organization	3	0	0	3	40	60	3	3
2	U21CD301	PCC	Operating Systems	3	0	0	3	40	60	3	3
3	U21CS302	PCC	Data Structures	3	0	0	3	40	60	3	3
4	U21CD301	PCC	Database Management Systems	3	0	0	3	40	60	3	3
5	U21CM301	PCC	Python Programming	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U21CS3L1	PCC	Data Structures Lab	0	0	3	3	25	50	3	1.5
7	U21 CD3L1	PCC	Database Management Systems Lab	0	0	3	3	25	50	3	1.5
8	U21CM3L1	ESC	Python Programming Lab	0	0	3	3	25	50	3	1.5
***Bridge Course**											
9.	U21CS3L2	ESC	C Programming Lab	-	-	2	2	50	-	-	0
10	U21EN3L2	HSMC	Effective Communication Skills Lab	-	-	2	2	50	-	-	0
Total				**15**	**1**	**9 (*13)**	**24 (*28)**	**275 (*375)**	**450**	**--**	**19.5**

***: Bridge course for lateral entry students only.**

L: Lecture (Hrs/Wk/Sem) **T:** Tutorial (Hrs/Wk/Sem) **P:** Practical **D:** Drawing (Hrs/Wk/Sem)
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC:** Basic Science Course
ESC: Engineering Science Course Including Management Course **PCC:** Program core course **MA:** Mathematics **HSMC:** Humanities & Social Sciences **EN:** English
CM: CSE-AIML **PH:** Physics **EC:** Electronics Communication
CD: CSE-Data Science **AM:** AI&ML **IT:** Information Technology

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2022-23)
B.E. IV-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21MA402	BSC	Mathematics – III (Mathematics for Data Science)	3	1	-	3	40	60	3	4
2	U21EN401	HSMC	English For Technical Communication	2	-	-	2	40	60	3	2
3	U21ME409	ESC	Operations Research	3	-	-	3	40	60	3	3
4	U21CS402	PCC	JAVA Programming	3	-	-	3	40	60	3	3
5	U21CD401	PCC	Basics of Data Science	3	1	-	3	40	60	3	4
Practical/ Laboratory Course											
6	U21EN4L1	HSMC	Advanced Communication Skills	-	-	3	3	25	50	2	1.5
7	U21CS4L1	PCC	JAVA Programming Lab	0	0	3	3	25	50	3	1.5
8	U21CD4L1	PCC	Data Science Using R lab	0	0	3	3	25	50	3	1.5
Total				**14**	**1**	**9**	**23**	**275**	**450**	**--**	**20.5**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* ***P*:** Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
BSC: Basic Science Course **ESC**: Engineering Science Course **PCC:** Program core course
HSMC: Humanities & Social Sciences Including Management Course **AM:** AI&ML
MA: Mathematics **EN:** English **PH**: Physics
CM: CSE-AIML **EC:** Electronics Communication
CD: CSE-Data Science **IT:** Information Technology

Note:

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LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2023-24)
B.E. V-Semester (Tentative)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21CD501	PCC	Design and Analysis of Algorithms	3	0	0	3	40	60	3	3
2	U21CD502	PCC	Discrete Mathematics	3	1	0	3	40	60	3	4
3	U21CD503	PCC	Artificial Intelligence	3	0	0	3	40	60	3	3
4	-	PEC	Professional Elective-I	3	0	0	3	40	60	3	3
5	-	OEC	Open Elective-I	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U21CD5L1	PCC	Artificial Intelligence Lab	0	0	3	3	25	50	3	1.5
7	U21CD5L2	PCC	Design and Analysis of Algorithms Lab	0	0	3	3	25	50	3	1.5
Internship											
8	U21CD5P1	PROJ	Internship (During Summer Vacations after V Sem)	-	-	2	2	50	-	-	1
Total				**15**	**1**	**8**	**23**	**300**	**400**	**--**	**20**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC**: Basic Science Course
ESC: Engineering Science Course Including Management Course **PCC:** Program core course **MA**: Mathematics **HSMC:** Humanities & Social Science **EN:** English
CM: CSE-AIML **PH**: Physics **EC:** Electronics Communication
CD: CSE-Data Science **AM:** AI&ML **PCC:** Program core course
PEC: Professional Elective Course **OEC:** Open Elective Course **PROJ:** Project

Note:

1. Each contact hour is a Clock Hour.
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LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2023-24)
B.E. VI-Semester (Tentative)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21MB601	HSMC	Business Economics and Financial Analysis	3	0	0	3	40	60	3	3
2	U21CD601	PCC	Machine Learning	3	0	0	3	40	60	3	3
3	U21CD602	PCC	Distributed Database	3	1	0	3	40	60	3	4
4	-	PEC	Professional Elective-II	3	0	0	3	40	60	3	3
5	-	OEC	Open Elective-II	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U21CD6L1	PCC	Machine Learning Lab	0	0	3	3	25	50	3	1.5
7	U21CD6L2	PCC	Distributed Database Lab	0	0	3	3	25	50	3	1.5
Report Writing											
8	U21EN6L1	HSMC	Technical Report Writing	-	-	2	2	50	-	-	1
Seminar											
9	U21CD6P1	PROJ	Technical Seminar	-	-	2	2	50	-	-	1
Project											
10	U21CD6P2	PROJ	Mini Project	-	-	6	6	50	50	--	3
Skill Development Course											
11	U21MA6L1	BSC	Aptitude and Reasoning	-	-	2	-	50	-	-	1
Total				**12**	**1**	**18**	**29**	**410**	**390**	**--**	**22**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* ***P*:** Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC**: Basic Science Course
ESC: Engineering Science Course **PCC:** Program core course **HSMC:** Humanities & Social Sciences Including Management Course **MA**: Mathematics **EN:** English
CM: CSE-AIML Communication **PH:** Physics **EC:**Electronics
CD: CSE-Data Science **AM:** AI&ML
PCC: Program Core Course **PEC:** Professional Elective Course **OEC:** Open Elective Course
PROJ: Project **MB:** Management Studies

Note:

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING - (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2024-25) (Tentative)
B.E. VII-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U21CD701	PCC	Data Mining	3	0	0	3	40	60	3	3
2	U21CD702	PCC	Data Handling and Visualization	3	0	0	3	40	60	3	3
3	-	PEC	Professional Elective III	3	0	0	3	40	60	3	3
4	-	PEC	Professional Elective IV	3	0	0	3	40	60	3	3
5	-	OEC	Open Elective-III	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
7	U21CD7L1	PCC	Data Mining Lab	-	0	3	3	25	50	3	1.5
8	U21CD7L2	PCC	Data Handling and Visualization Lab	-	0	3	3	25	50	3	1.5
Total				**18**	**0**	**6**	**24**	**290**	**460**	**--**	**21**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC**: Basic Science Course
ESC: Engineering Science Course **PCC:** Program core course **HSMC:** Humanities & Social Sciences Including Management Course **MA**: Mathematics **EN:** English
CM: CSE-AIML **PH**: Physics **EC:** Electronics Communication
CD: CSE-Data Science **AM:** AI&ML **PCC:** Program Core Course
PEC: Professional Elective Course **OEC**: Open Elective Course **PROJ:** Project

Note:

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING - (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2024-25) (Tentative)
B.E. VIII-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21CD801	PCC	Natural Language Processing	3	0	0	3	40	60	3	3
2	-	PEC	Professional Elective V	3	0	0	3	40	60	3	3
3	-	OEC	Open Elective IV	3	0	0	3	40	60	3	3
Viva											
4	U21CD8P1	PROJ	Comprehensive Viva	0	0	4	4	100			2
Project											
5	U21CD8P2	PROJ	Major Project	0	0	16	16	50	150	--	8
Total				9	0	20	29	270	330	--	**19**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**: Practical **D**: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination **BSC**: Basic Science Course
ESC: Engineering Science Course **PCC:** Program core course **CM:** CSE-AIML
HSMC: Humanities & Social Science Including Management Course **EN:** English
MA: Mathematics **PH**: Physics **AM:** AI&ML
CD: CSE-Data Science **PCC:** Program Core Course
EC: Electronics Communication **OEC**: Open Elective Course **PROJ:** Project
PEC: Professional Elective Course

Note:

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING - (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in	
Theory Course											
1	U21CD504	PEC 1	Graph Theory	3	0	0	3	40	60	3	3
	U21CD505		Computer Networks	3	0	0	3	40	60	3	3
	U21CD506		Automata Languages and Computation theory	3	0	0	3	40	60	3	3
	U21CD507		Web Technologies	3	0	0	3	40	60	3	3
2	U21CD603	PEC 2	Block Chain Technology	3	0	0	3	40	60	3	3
	U21CD604		Network Security and Cryptography	3	0	0	3	40	60	3	3
	U21CD605		Statistical Simulation and data Analysis	3	0	0	3	40	60	3	3
	U21CD606		Software Engineering	3	0	0	3	40	60	3	3
3	U21CD703	PEC 3	Information Storage and Management	3	0	0	3	40	60	3	3
	U21CD704		Cloud Computing	3	0	0	3	40	60	3	3
	U21CD705		Business Intelligence and Analytics	3	0	0	3	40	60	3	3
	U21CD706		Software Testing Methodologies	3	0	0	3	40	60	3	3
4	U21CD707	PEC 4	Basics of Soft Computing Techniques	3	0	0	3	40	60	3	3
	U21CD708		Semantic Web Social Networks	3	0	0	3	40	60	3	3
	U21CD709		Deep Learning	3	0	0	3	40	60	3	3
	U21CD710		Software Project Management	3	0	0	3	40	60	3	3
5	U21CD802	PEC 5	Optimization Techniques	3	0	0	3	40	60	3	3
	U21CD803		Internet Of Things	3	0	0	3	40	60	3	3
	U21CD804		Cognitive Science and Analytics	3	0	0	3	40	60	3	3
	U21CD805		Secure Software Design and Enterprise Computing	3	0	0	3	40	60	3	3

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PROFESSIONAL ELECTIVES

S.No.	PE-I	PE-II	PE-III	PE-IV	PE-V
1	Graph Theory	Block Chain Technology	Information Storage and Management	Basics of Soft Computing Techniques	Optimization Techniques
2	Computer Networks	Network Security and Cryptography	Cloud Computing	Semantic Web Social Networks	Internet Of Things
3	Automata Languages and Computation theory	Statistical Simulation and data analysis	Business Intelligence and Analytics	Web and Social Media Analytics	Cognitive Science and Analytics
4	Web Technologies	Software Engineering	Software Testing Methodologies	Software Project Management	Secure Software Design and Enterprise Computing

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(w.e.f Academic Year 2021-22)
OPEN ELECTIVE COURSES OFFERED

S. No.	Course Code	Category	Course Title
1	U21EE508	OEC 1	Non-Conventional Energy Systems
	U21EE509		Energy Conservation and Management
	U21CS508		Data Base Management Systems
	U21IT506		Data Structures
	U21ME509		Basics of Mechanical Engineering
	U21ME510		Modern Manufacturing Processes
	U21CE510		Disaster Preparedness and Management
	U21CE511		Civil Engineering Principles and Practices
	U21EC507		Principles of Electronic Communication
	U21EC508		Semi-Conductor Devices
	U21MB502		Managerial Communication
	U21MB503		Managerial Science and Theory
	U21SH501		History of Science & Technology
	U21SH502		Economic Policies in India

S. No.	Course Code	Category	Course Title
2	U21EE608	OEC 2	Fundamental of Power Electronics
	U21EE609		Electrical Installation and Safety
	U21CS607		Java Programming
	U21IT606		Operating Systems
	U21ME608		Basics Of 3-D Printing
	U21ME609		Optimization Methods for Engineers
	U21CE607		Construction Materials
	U21CE608		Engineering Geology
	U21EC607		Principles of Data Communication and Network
	U21EC608		Embedded Systems
	U21MB602		Total Quality Management

	U21MB603		Innovation Management
	U21SH601		Indian Music System
	U21SH602		Introduction to Art and Aesthetics

S. No.	Course Code	Category	Course Title
3	U21EE711	OEC 3	Introduction to Electrical Vehicles
	U21EE712		Design estimation and Costing of Electrical Systems
	U21CS711		Data Sciences
	U21IT705		Basics of Artificial Intelligence
	U21ME711		Renewable Energy Resources
	U21ME712		Cooling of Electronic Components
	U21CE711		Environmental Systems
	U21CE712		Urban Transportation System
	U21EC703		IOT and its protocols
	U21EC704		Television and Video Engineering
	U21MB702		Logistics Management
	U21MB703		Management of Start Up's
	U21SH701		Display Devices
	U21SH702		Comparative Study of Literature

S. No.	Course Code	Category	Course Title
4	U21EE804	OEC 4	Smart Building Systems
	U21EE805		Industrial Automation
	U21CS806		Basics of Machine Learning
	U21IT802		Cloud computing
	U21ME806		Hybrid Vehicle Technology
	U21ME807		Power Plant Engineering
	U21CE806		Green Building Technology
	U21CE807		Environmental Impact Assessment
	U21EC805		Fundamentals of Wireless Communication
	U21EC806		Fundamental Digital Design using Verilog HDL

	U21MB802		Entrepreneurship
	U21MB803		E - Marketing
	U21SH801		Corrosion Science and Technology
	U21SH802		Introduction To Philosophical Thoughts

Course Code	Course Title						Core/Elective
U21EC304	**Digital Electronics & Computer Organization**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Basic Electrical Engineering	**3**	**0**	**0**	**0**	**40**	**60**	**3**

Course Objectives:

The objectives of this course are

1. To understand the basic building blocks of digital hardware and various minimization techniques.
2. To analyze and design the Combinational and Sequential circuits.
3. Describe the basic structure and operation of digital computer and understand various memory types

Course Outcomes:

On Successful completion of this course, student will be able to

1. Demonstrate the number system conversions and simplify Boolean functions.
2. Analyze and simplify Boolean expressions using Karaugh-maps, tabulation method and design combinational circuits.
3. Analyze and design various Sequential circuits.
4. To illustrate the operation of digital computer and to understand its organization.
5. Understand the various memory types.

UNIT – I

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Fundamentals of Digital Logic Gates.

UNIT – II

Combination Circuits: Implementation of logic functions using K-Map Quine- McCluskey Tabular method, Adders: half adder, full adder, Subtractors, Comparators, Multiplexers, De-multiplexers, Encoders and Decoders.

UNIT-III

Sequential Circuits: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops. Excitation Table of all Flip Flops, Conversion from one type of Flip-Flop to another.

UNIT-IV

Basic Structure of Computers: Computer Types, Block diagram of Digital computer, Basic Operational Concepts, Bus Structures, Stored program organization and computer registers, Instruction formats.

Input/output Organization: Block diagram of I/O organization, Interrupts, direct memory access. Asynchronous data transfer: strobe control and hand shaking.

UNIT -V

The Memory System: Basic concepts, Semiconductor RAM memories, read-only memories, Speed, Size and Cost, Primary memory, Auxiliary memory, Associative memory, Cache memories, Virtual Memories, Memory management requirements.

Text Books:

1. Morris Mano M. and Michael D. Ciletti, “Digital Design, With an Introduction to Verilog HDL”, Pearson 5 th edition, 2013.
2. RP Jain “Modern Digital Electronics”, Fourth Edition McGraw hill education (India) Pvt Limited, 2003
3. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, McGraw Hill, 2002.

Suggested Readings:

1. Ronald J Tocci, Neal Widmer, Greg Moss, “Digital Systems: Principles and Applications”, Pearson 11th Edition, 2011.
2. Computer Architecture a quantitive approach, Jhon L. Hennessy and David A. Patterson, Fourth Edition Elsevier.
3. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

Course Code	Course Title						Core/Elective
U21CD301	**Operating Systems**						**Core**
Prerequisite	**Contact Hours Per Week**				**CIE**	**SEE**	**Credits**
Digital Logic & Design	**L**	**T**	**D**	**P**			
	3	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

The objectives of this course are

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. To Understand Virtual machine concepts, calls for managing processes, memory and the file system.

Course Outcomes:

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

1. Understand the fundamental concepts and Functions of operating system.
2. Analyze various scheduling algorithms.
3. Understand deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Understand the functionality of file systems and perform administrative tasks on Linux Servers

UNIT-I

Introduction: Computer System organization & Architecture, Operating System Structure & Operations, Process, Memory and Storage Managements, Protection and Security, Distributed and Special-Purpose Systems, Computing Environments.

System Structures: System calls, Types of System Calls, System Programs.

Process Concept: Overview, Process Scheduling, Operations on Processes, Inter process communication, Communication in Client/Server Systems, Operating System Examples.

UNIT-II

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Priority, Round Robin)

Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization, Dining Philosophers problem Monitors.

Deadlocks: System Model, Deadlock characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-III

Memory-Management Strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Background, Demand paging, Copy-on-write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.

Storage Management: File System, File Concept, Access Methods, Directory Structure, File-System Mounting, File sharing, Protection.

UNIT-IV

Implementing File Systems: File System-Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, Log-Structured File Systems, NFS.

Secondary Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, RAID Structure, Stable-Storage Implementation, Tertiary-Storage Structure.

UNIT-V

Protection and Security: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of access rights,

System Security: The security problem, program Threats, System and System Network Threats, Cryptography as a Security tool, User Authentication, Implementing Security Defences, firewalling to protect Systems and Networks, Case Studies- Linux System.

Text Books:

Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Principles, ninth Edition, John Wiley & Sons Publication,2012

A.Tanenbaum- Modern Operation Systems. Third edition, Pearson Education, 2008.

Suggested Readings:

1. William Stallings - Operating Systems, Fifth Edition, Pearson Education, 2005.
2. Ida M.Flynn, Understanding Operating Systems, Sixth Edition, Cengage, 2011
3. Operating Systems: Principles and Practice, Thomas Anderson and Michael Dahlin, Recursive Books, 2014.
4. The Design of Unix Operating System, Maurice Bach, Prentice Hall, 1988.

Course Code	Course Title						Core/Elective
U21CS302	**DATA STRUCTURES**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Programming for Problem Solving	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

Develop ability to

1. Develop skills to design and analyze simple linear and nonlinear data structures, such as stacks, queues and lists and their applications.
2. Gain programming skills to implement sorting and searching algorithms
3. Strengthen the ability to identify and apply the suitable data structures for the given real-world problem.
4. Gain knowledge in practical applications of data structures
5. Understand essential for future programming and software engineering courses.

Course Outcomes:

At the end of the course, student would be able to

1. Implement various data structures using arrays, linked lists
2. Develop ADT necessary for solving problems based on Stacks and Queues
3. Implement binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Implement hash functions and handle collisions.
5. Implement various kinds of sorting techniques and apply appropriate techniques for solving given problem.

UNIT – I

Introduction Data Structures and Algorithms:

Introduction to data structures, classification of data structures, operations on data structures; Algorithm Specification, Recursive algorithms, Data Abstraction, Performance analysis- Time Complexity and Space Complexity, Asymptotic Notation-Big O, Omega, and Theta notations.

UNIT – II

Stacks and Queues:

Stacks: Stack ADT, definition and operations, Implementations of stacks using array, applications of stacks, Arithmetic expression conversion and evaluation.

Queues: Queue ADT, definition and operations, Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (deque).

UNIT – III

Linked Lists: Introduction, singly linked list, representation of a linked list in memory, operations on a Singly Linked List, Implementation of Singly Linked List., Doubly Linked Lists; Operations on Doubly Linked List, Implementation of Doubly Linked List, Circular linked list, Implementation of Stack and Queue using linked list.

UNIT – IV

Searching Techniques: Linear Search and Binary Search algorithms.

Sorting Techniques: Bubble Sort, Insertion sort, Selection Sort, Merge Sort, and Quick Sort, Comparison among Sorting techniques.

Hashing: Static Hashing, Hash Tables, Hash Functions, Overflow Handling, Theoretical Evaluation of overflow Techniques

UNIT – V

Trees: Introduction, Binary Trees, Tree Traversals, Threaded Binary Trees, Binary Search Tree, Heap Tree, AVL Tree.

Graphs: Graph Abstract Data Type, Representation of Graph, Graph Traversals -DFS and BFS, Spanning Tree, Prim ‘s and Kruskal ‘s Algorithms.

Text Books:

1. “Fundamentals of Data Structures in C”, Ellis Horowitz, Sartaj Sahani, Susan Anderson Freed, Computer Science Press, 2004
2. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
3. Reference Books:

Suggested Readings:

1. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition, 2004.
2. Mark A Weiss, “Data Structures and Algorithm Analysis In C”, Second Edition (2002), Pearson
3. “Data Structures and Algorithms in C++”, second Edition by Michael T. Goodrich and Roberto Tamassia

Course Code	Course Title						Core/Elective
U21CD302	**Database Management Systems**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Programming for Problem Solving	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

The objectives of this course are to impart knowledge

1. Understand the role of database management system in an organization and learn the database concepts.
2. Design databases using data modelling and Logical database design techniques.
3. Construct database queries using relational algebra and calculus and SQL.
4. Understand the concept of a database transaction and related concurrent, recovery facilities.
5. Understand the concepts of Triggers and Stored Procedures.

Course Outcomes:

At the end of the Course, Student would be:

1. Design ER-models to represent simple database application scenarios and Construct database queries using SQL.
2. Construct database queries using relational algebra and calculus.
3. Recognize and identify the use of normalization and functional dependency in database design.
4. Apply the concept of a data base transaction and related concurrent, recovery, facilities
5. Apply and relate how to evaluate a set of queries in query processing.

UNIT - I:

Conceptual Modeling Introduction: Introduction to Data bases: Purpose of Database systems, view of data, data models, Database languages, Database users, various components of overall DBS architecture, various concepts of ER model, basics of Relational Model.

SQL Query – Basics: SQL – Data Definition commands, Queries with various options, Data manipulation commands, Views, Joins, views, integrity and security.

UNIT – II:

Relational Approach: Relational algebra and calculus, Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus: Tuple relational calculus, Domain relational calculus, expressive power of algebra and calculus.

UNIT – III:

Introduction to NoSQL: Introduction, Overview and History of NoSQL Databases – The Definition of the Four Types of NoSQL Databases, differences between SQL and NoSQL.

Normalization: Pitfalls of RDBD, Lossless join decomposition, functional dependencies, Armstrong axioms, normalization for relational databases 1st, 2nd and 3rd normal forms, BCNF, Basic definitions of MVDs and JDs, 4th and 5th normal forms.

UNIT - IV:

Transaction Management: Transaction processing: Transaction concept, transaction State, implementation of atomicity and durability, concurrent executions, serializability, recoverability.

Concurrency Control: Lock-based protocols, time stamp-based protocols, validation-based protocols, multiple granularities, multi-version schemes, deadlock handling.

UNIT – V:

Data Storage: Overview of physical storage media, magnetic disks, storage access, file organization, organization of records in files.

Indexing and Hashing: Basic concepts, types of indexing, difference between B and B+ Indexing, static hashing, Dynamic Hashing.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 6th Edition, 2017.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 6th Edition, 2014.
3. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2007.

Suggested Readings:

1. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States, 1st Edition, 2000.
2. Peter Rob, Carlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003.

Course Code	Course Title						Core /Elective
U21CM301	**PYTHON PROGRAMMING**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Programming for Problem Solving	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

Develop ability to

1. Learn about Python programming language syntax, semantics, and the runtime environment
2. Familiarized with universal computer programming concepts like data types, containers
3. Acquire general computer programming concepts like conditional execution, loops & functions
4. Grasp the general coding techniques and object-oriented programming
5. Analyze about basic library modules.

Course Outcomes:

At the end of the course, student would be able to

1. Develop essential programming skills in computer programming concepts like data types, containers.
2. Apply the basics of programming in the Python language.
3. Solve coding tasks related conditional execution, loops.
4. Acquire coding tasks related to the fundamental notions and techniques used in object-oriented programming
5. Write basic programs related to basic library modules.

UNIT- I:

Introduction to Python: Data Types: Declaring and using Numeric data types: int, float, bool, complex, string data type and string operations, standard input and output functions, type conversion

Python Program Flow Control: Conditional blocks using if, else and elif, Control blocks using for loop, while loop. Loop manipulation using pass, continue, break and else.

UNIT- II:

Functions: Creating, parameters and return values, Using Keyword Arguments and Default Parameter Values, Using Global Variables and Constants, recursive functions, lambda functions.

Python Data Structures: Lists- basic list operators, replacing, inserting, removing an element; searching and sorting lists; tuples.

UNIT-III:

Dictionaries: Literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Sets and Strings operations.

Introduction to Object Oriented Programming: Class, object, attributes and methods; defining classes, inheritance, polymorphism, abstract classes, Exception handling.

UNIT-IV:

Using Databases in Python:

Python MySQL Database Access, Create Database Connection, CREATE, INSERT, READ, UPDATE and DELETE Operation, DML and DDL Operation with Databases, Performing Transactions Handling, Database Errors.

UNIT- V:

Python for Data Analysis: Numpy: Introduction to numpy, creating arrays, using arrays and Scalars, Indexing Arrays, Array Transposition, Universal Array Function, Array Processing, Array Input and Output.

Pandas: What are pandas? Where it is used? Series in pandas, Index objects, Reindex, Drop Entry, Selecting Entries, Data Alignment, Rank and Sort Summary, Statics Missing Data, Index Hierarchy.

Text Books:

1. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017
2. Vamsi kurama, "Python Programming: A modern approach", ISBN-978-93-325-8752- 6, Pearson, 2018.

Suggested Readings:

1. Mark Lutz, "Learning python", ISBN: 1-56592-464-9, Orielly, 4th edition, 1999.
2. W.Chun, "Core python programming", ISBN-13: 978-0132269933, Pearson, 2nd edition, 2016.
3. Kenneth Lambert, "Fundamentals of Python First Programs", ISBN-13: 978-1337560092, Cengage Learning publishers, First Edition, 2012.
4. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", ISBN-13: 978- 1491939369. O'Reilly, 2nd Edition, 2016.
5. R Nageswara Rao, "Core Python Programming", Dream tech press, 2017 Edition.
6. Mike Mc Grath "Python in easy steps: Makes Programming Fun", Kindle Edition, 2017.

Course Code	Course Title						Core /Elective
U21CS3L1	**DATA STRUCTURES LAB**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Programming for Problem Solving Lab	**-**	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

Develop ability to

1. Understand essential concepts of simple linear and nonlinear data structures.
2. Analyze and implement programming skills to implement sorting and searching algorithms.
3. Apply the suitable data structures for the given real-world problems.
4. Acquire knowledge in practical applications of data structures.
5. Provide solutions for various graphical concepts.

Course Outcomes:

At the end of the course, student would be able to

1. Write programs in various data structures using arrays and linked lists.
2. Develop ADT necessary for solving problems based on Stacks and Queues.
3. Evaluate binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Apply hash functions and handle collisions.
5. Implement various kinds of sorting techniques and apply appropriate techniques forsolving a given problem.

LIST OF EXPERIMENTS:

1. Implementation of Stacks and Queues using Arrays.
2. Solving Towers of Hanoi problem.
3. Implementation of Circular Queue.
4. Solving tic-tac -toe problem.
5. Implementation of Infix to Postfix Conversion, Postfix Expression Evaluation.
6. Implementation of Singly Linked List
7. Implementation of Doubly Linked List.
8. Implementation of Circular Linked List.
9. Implementation of Stacks, Queues using Linked Lists.
10. Implementation of Binary Search and Hashing
11. Implementation of Operations on Binary Tree (Delete Entire Tree, Copy Entire Tree, Mirror Image, Level Order, Search for a Node etc.)
12. Implementation of Tree Traversals on Binary Trees.
13. Implementation of Binary Search Tree. (Insertion, Deletion and Search operations).
14. Implementation of operations on AVL Trees.
15. Implementation of Traversal on Graphs.
16. Implementation of Selection, Merge, Quick and Insertion Sort.
17. Implementation of Prims and Kruskal's Algorithm.

Suggested Readings:

1. S. Lipschutz, "Data Structures", Tata McGraw Hill Education, 1st Edition, 2008.
2. D. Samanta, "Classic Data Structures", PHI Learning, 2nd Edition, 2004.
3. Mark A Weiss, Data Structures and Algorithm Analysis In C, SecondEdition (2002), Pearson.

Course Code	Course Title						Core/Elective
U21IT4L2	**Database Management Systems Lab**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Programming for Problem Solving Lab	**-**	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

Develop ability to

1. Introduce ER data model, database design and normalization
2. Learn SQL basics for data definition and data manipulation
3. To understand the basic concepts and the applications of database systems.
4. Be acquainted with the basics of transaction processing and concurrency control.
5. Learn the concepts of Views, Stored Procedure and Triggers.

Course Outcomes:

After completing this course, the student will be able to:

1. Design database schema for a given application and apply normalization
2. Gather skills in using SQL commands for data definition and data manipulation.
3. Demonstrate creation and usage of Views and Stored Procedures using SQL.
4. Develop solutions for database applications using procedures, cursors and triggers
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

LIST OF EXPERIMENTS:

Scenario: Product-Sales database: South wind database is a sample database used by Organization. The database contains the sales data for South wind Traders; it is foods export-import Company. Using this schema to demonstrate the how customer can choose and order products, how orders are placed and how those products get delivered to the customer. Products: This Entity will have all the products details where suppliers will supply products based on customers demand. Supplies: This Entity will supply the products demanded by the customers. Shippers: This Entity will take the orders from suppliers and deliver to customers. Employees: Employees will monitor the orders placed by customers. Invoices: This Entity will take care of billing process based on customer order. Etc... Identify some more entities and find out relationship between them. Product-sales the above process involves many steps like

1. Analyzing the problem and identifying the Entities and Relationships,
2. E-R Model
3. Relational Model
4. Normalization
5. Creating the database
6. Querying.

Experiment 1: E-R Model: Analyze and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc. Identify the primary keys for all the entities. Identify the other keys like Foreign Key and constraints like NULL, NOT NULL, CHECK etc. Example to create for products, customers, suppliers, orders, employees, order details, categories, among others. Students should submit E-R diagrams using the above tables.

Experiment 2: DDL: How to create tables, altering the database or tables, dropping tables if not required. You will also try truncate, rename commands etc. Data Definition Language (DDL): create, alter, drop.

Experiment 3: DML: Data Manipulation Language Commands (DML) commands are used to for managing data within schema objects. Exercising the commands using DML: insert, delete, update on the following tables: products, customers, suppliers, orders, , employees, order details, categories.

- INSERT – insert data into a table.
- UPDATE – updates existing

Experiment 4: Querying: Data within a table.

- DELETE – deletes single or all records from a table.

Data Query Language – Select Populate all the tables designed in experiment: 2 with appropriate data.
Practice queries on Aggregate functions like count, max, min, avg, sum Practice queries like nested queries/co-related queries using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, group by, having etc.
Joins: Join, Left Outer Join, Right Outer Join, Self-Join

Experiment 5: Querying (continued…)

Some examples to practice the queries:

1. Display all the order details of given a customer.
2. Display all the products.
3. Get the highest sold product from given supplier ID
4. List all products grouped by category
5. List the products, whose products unit price is greater than all the products of average.
6. List Details of order and customer of each order
7. List the products which were sold in year 1997
8. Display the total amount for each order
9. Display Order Details for given an order ID
10. Order Details: product name and unit price for given order ID Exercising Simple to complex
11. Queries using joins, nested and co-related queries.

Experiment 6: Programs on pl/SQL

1. Write a PL/SQL program to swap two numbers.
2. Write a PL/SQL program to find the largest of three numbers
3. Write a PL/SQLprogramtofindthetotalandaverageof6subjectsanddisplaythegrade.
4. Write a PL/SQL program to find the sum of digits in a given number.
5. Write a PL/SQL program to display the number in reverse order.
6. Write a PL/ SQL program to check whether the given number is prime or not.
7. Write a PL/SQL program to find the factorial of a given number.

Experiment 7: Stored Procedures:

1. Create a stored procedure, Alter and Drop a procedure, IN, OUT, IN & OUT parameters
2. Create a Procedure to display order details of given customer ID like ordered, order Date, Required Date, Shipped Date
3. Create a procedure to accept a customer ID and display the customer order history (product name and how much quantity ordered for that particular product)
   Ex: product name, Total quantity he/she ordered.
4. Create a procedure to display Ten Most Expensive Products Columns should be displayed Product name & Unit price

Experiment 8: Views:

1. Create a view to display the current product list which is available (not discontinued)

2. Create a view to display the products by category
3. Display product name, quantity Per Unit, units In Stock, Discontinued
4. Create a view as ―Invoices‖ to display all the information from order, customer, and shipper for each Order Details

Experiment 9: Triggers

Demonstrate Create Trigger, Alter Trigger, Drop Trigger, Row Level, Table Level triggers, Before Insert, After Insert, Before Update, After Update, Before Delete, After Delete

Experiment 10: Case study: Book Publishing Company

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.
A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

a. Analyze the data required.
b. Normalize the attributes.

Create the logical data model using E-R diagrams.

Experiment 11: Case Study: General Hospital

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study

For the above case study, do the following.

a. Analyze the data required.
b. Normalize the attributes.
c. Create the logical data model using E-R diagrams.

Suggested Readings:

1. Raghurama Krishnan, Johannes Gehrke, ―Database Management Systems‖, Tata McGraw Hill, 3rd Edition, 2008.
2. Silberschatz, Korth, ―Database System Concepts‖, McGraw Hill, V edition, 2005.
3. Rick F. Vander Lans, ―Introduction to SQL‖, Pearson education, 2007.
4. B. Rosenzweig and E. Silvestrova, ―Oracle PL/SQL‖, Pearson education, 2004.
5. Dr. P. S. Deshpande, ―SQL & PL/SQL for Oracle 10g‖, Black Book, Dream Tech, 2006.
6. M. Mc Laughlin, ―Oracle Database 11g PL/SQL Programming‖, TMH, 2017.

Course Code	Course Title						Core/Elective
U21CM3L1	**PYTHON PROGRAMMING LAB**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Programming for Problem Solving Lab	**-**	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

Develop ability to

1. Elucidate problem solving through python programming.
2. Learn the use of functions in python programming.
3. Analyze solutions using Object Oriented concepts.
4. Design programs using File Handling Functions.
5. Create Mini-projects using various libraries.

Course Outcomes:

At the end of the course, student would be able to

1. Summarize the fundamental concepts of python programming.
2. Outline the control statements and functions by writing python program.
3. Demonstrate file handling operations and packages.
4. Interpret object-oriented programming in python.
5. Apply the suitable libraries to solve simple problems.

LIST OF EXPERIMENTS:

1.

a. Write a python program for Python Variables, Executing Python from the Command Line, Editing Python Files, and Python Reserved Words.
b. Write a python program to add two numbers.
c. Write a program to demonstrate different number data types in python.
d. Write a program to perform different arithmetic operations on numbers in python.

2.

a. Write a python program to print a number is positive/negative using if-else.
b. Write a python program to find largest number among three numbers.
c. Write a Python program to swap two variables.
Python Program to print all Prime Numbers in an Interval.

3.

a. Write a python program to check whether the given string is palindrome or not.
b. Write a program to create, concatenate and print a string and accessing substring from a given string.
c. Functions: Passing parameters to a Function, Variable Number of Arguments, Scope, and Passing Functions to Function.

4.

a. Create a list and perform the following methods
1) insert () 2) remove () 3) append () 4) len() 5) pop() 6)clear()

b. Create a dictionary and apply the following methods
    1) Print the dictionary items 2) access items 3) useget () 4) change values 5) use len()
c. Create a tuple and perform the following methods
    1) Add items 2) len() 3) check for item in tuple 4)Access items

5.
a. OOP concepts: Classes, File Organization, Special Methods, Inheritance, Polymorphism, Special Characters, Character Classes, Quantifiers, Dot Character, Greedy Matches, Matching at Beginning or End, Match Objects, Compiling Regular Expressions.
b. Write a python Program to call data member and function using classes and objects.

6.
a. Write a program to double a given number and add two numbers using lambda ()
b. Write a program for filter () to filter only even numbers from a given list.
c. Write a Python Program to Make a Simple Calculator.

7.
a. Demonstrate a python code to print try, except and finally block statements
b. Write a python program to open and write "hello world" into a file and check the access permissions to that file?
c. Python program to sort the elements of an array in ascending order and Descending order

8.
a. Write a python program to open a file and check what are the access permissions acquired by that file using OS module.
b. Write a program to perform basic operations on random module.

9.
- Write a python program to practice some basic library modules

a. Numpy
b. SciPy

10. Introduction to basic concept of GUI Programming and Develop desktop based application with python basic Tkinter() Module?

11. Write a python program to create a package (college),sub package (alldept),modules(it,cse) and create admin function to module?

12. Write a python program to create a package (Engg), sub package (years), modules (sem) and create staff and student function to module?

Suggested Readings:

1. Gerald J. Kowalski, Mark T. Maybury: Information Storage and Retrieval Systems: Theory and Implementation, Second Edition Kluwer Academic Publishers
2 Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
3. Modern Information Retrival by Yates Pearson Education.
4. Information Storage & Retieval by Robert Korfhage – John Wiley & Sons.

Course Code	Course Title						Core / Elective
21CS3L2	**C PROGRAMMING LAB**						**Core**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
-	**L**	**T**	**D**	**P**			
	-	**-**	**-**	**2**	**50**	**-**	**0**

Course Objectives:

Develop ability to

1. To understand the fundamentals of programming in C Language.
2. To write, compile and debug programs in C.
3. To formulate solution to problems and implement in C.
4. To effectively choose programming components to solve computing problems

Course Outcomes:

At the end of the course, student would be able to

1. Choose appropriate data type for implementing programs in C language.
2. Design and implement modular programs involving input output operations, decision making and looping constructs.
3. Implement search and sort operations on arrays.
4. To decompose a problem into functions and to develop modular reusable code
5. Apply the concept of pointers for implementing programs on dynamic memory management and string handling & Design and implement programs to store data in structures and files.

LIST OF EXPRIMENTS:

1. Finding maximum and minimum of given set of numbers, finding roots of quadratic equation.
2. Sinx and Cosx values using series expansion.
3. Conversion of binary to decimal, octal, hexadecimal and vice-versa.
4. Generating Pascal triangle, pyramid of numbers.
5. Recursion: factorial, Fibonacci, GCD.
6. Matrix addition and multiplication using arrays.
7. Programs on pointers: pointer to arrays, pointer to functions.
8. Functions for string manipulations.
9. Programs on structures and unions.
10. File handling programs.

Suggested Reading:

1. Byron Gottfried, “Programming with C”, Schaum’s outlines, 2nd Edition, TATA McGraw-Hill.
2. A.K.Sharma, “Computer Fundamentals and Programming in C”, 2nd Edition, University Press.
3. E Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill Education, 2008.
4. Brian W. Kernighan and Dennis M. Ritchie, “the C Programming Language”, Prentice Hall of India, 1988.

Course code	**Course title**						Core/Elective
U21EN1L1	**EFFECTIVE COMMUNICATION SKILLS LAB (Common to all Branches)**						**Core**
Pre-requisites	**Contact Hours Per Week**				**CIE**	**SEE**	**Credits**
English	**L**	**T**	**D**	**P**			
	-	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

To enhance the listening and speaking skills of students by:

1. Giving them sufficient practice in listening with comprehension
2. Providing them ample opportunities to improve their public speaking skills and soft skills
3. Training them in the use of correct pronunciation, stress and intonation
4. Sensitizing them to the use of verbal and non-verbal communication appropriate to the context
5. Encouraging them to learn the art of conversation to suit formal and informal situation
6. Preparing them to make formal presentations and face interviews

Course Outcomes:

At the end of the course, student would be able to

1. Listen, understand and interpret formal and informal spoken language
2. Speak English with acceptable pronunciation, stress and intonation
3. Present themselves with confidence in formal situations
4. Participate in individual and group activities with relative ease
5. Use verbal and nonverbal communication while using soft skills & make formal presentations and face interviews

LIST OF ACTIVITIES:

1. Listening for comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Conversation Skills
4. Introducing Oneself and Others
5. Asking for and Giving information
6. Making Request and Responding to them Appropriately
7. Giving Instructions and Responding to them Appropriately
8. Making Formal Announcement and Emceeing
9. Group Discussion
10. Just A Minute (JAM)
11. Role Play
12. Debate
13. Public Speaking Skills and Body Language
14. Interviews
15. Formal Presentations.

Suggested Readings:

1. Board of Editors. Language and Life Skills Approach. Orient Black Swan,2018
2. Bala Subramaniam, T.A. Text book of English Phonetics for Indian Students, Macmillan, 1981.
3. CIEFL, Exercises in Spoken English. PART-III, Oxford University Press.
4. Pillai, Radhakrishna G. Spoken English for You – Level II. Emerald Publisher, 8th Edition.2014.
5. Sethi, J. and PV Dhamija. A Course in Phonetics and Spoken English. Prentice, India Learning Private Limited, 2nd Edition.1999
6. Robert. M. Sherfield & et al. Developing Soft Skills. Pearson Education.4th Edition. 2009.

Course Code	Course Title						Core / Elective
U21MA402	**MATHEMATICS – III (Mathematics for Data Science) (Branch - CSE-DS)**						**Core**
Prerequisite	**Contact Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Basic Mathematics	**3**	**1**	**-**	**-**	**40**	**60**	**4**

Course Objectives

Develop ability to

1. Interpret the measures of central tendency and dispersion.
2. Distinguish between explanatory and response variables and analyze data using correlation and regression.
3. Familiar with various probability distributions.
4. Acquire the concept of tests of hypothesis.
5. Employ basic analysis of time series data.

Course Outcomes

At the end of the course, student would be able to

1. Compute and interpret descriptive statistics.
2. Evaluate random processes which occur in engineering applications governed by the Binomial, Poisson, Normal and Exponential distributions.
3. Fit the models using Regression Analysis.
4. Apply Inferential Statistics to make predictions or judgments about the population from which the sample data is drawn.
5. Interpret Time series data.

UNIT-I:

Random Variables, Basic Statistics, Correlation and Regression:

Random variables – Discrete and Continuous, Probability mass function and density function, Mean, Variance, and **Correlation:** Karl-Pearson's correlation coefficient and Spearman's Rank correlation, Simple and Multiple Linear Regression (three variables case only), Statements of properties of Regression coefficients and problems.

UNIT-II:

Probability Distributions Discrete Distributions:

Binomial and Poisson distributions - definition, real life examples, Statements of their Mean and Variance, related problems, evaluation of statistical parameters. Continuous Distributions: Normal - definition, real life examples, Statements of their Mean and Variance and related problems, evaluation of statistical parameters for Normal distribution

UNIT-III:

Testing of Hypothesis-1 (Large sample):

Concept of Sampling distribution and Standard error, tests for single proportion, difference of proportions, single mean, difference of means and Chi-square test for independence of attributes

UNIT-IV:

Testing of Hypothesis-2 (Small Sample):

Tests for single mean, difference of means, Population variance, ratio of variances, ANOVA 1-way and 2- way. Estimation of confidence interval for Population mean.

Unit-V:

Time Series analysis:

Components of Time series, measuring trend by method of Moving averages, Straight line and Second-degree parabola, measuring seasonal variation by ratio to Trend method and Ratio to Moving averages method.

Text Books:

1. S. C.Gupta&V.K.Kapoor, "Fundamentals of Mathematical Statistics", S.Chand.
2. Richard A. Johnson," Probability and Statistics for Engineers", Pearson Education.
3. Jay Devore, "Probability and Statistics for Engineering and the Sciences", engage learning.

Suggested Readings:

1. Murat Kulahci,"Time series analysis and forecasting by example", John Wiley & Sons
2. S. C.Gupta&V.K.Kapoor, "Fundamentals of Applied Statistics", S.Chand.

Course Code	Course Title						Core/Elective
U21EN401	**ENGLISH FOR TECHNICAL COMMUNICATION [CSE, CSD, CIVIL, EEE]**						**Core**
Prerequisite	**Contact Hours Per Week**				**CIE**	**SEE**	**Credits**
English	**L**	**T**	**D**	**P**			
	2	**-**	**-**	**-**	**40**	**60**	**2**

Course Objectives

To expose the students to:

1. Understand the significance of Technical Writing
2. Various aspects of professional communication
3. Different types of business correspondence
4. Various styles of technical report writing
5. Designing, creating and developing technical manual
6. Familiarize with the technical features of information transfer

Course Outcomes

On successful completion of the course, the students would be able to:

1. Apply technical communication skills effectively
2. Adapt different types of official correspondence
3. Construct report writing using various techniques
4. Develop adequate skills of manual writing
5. Interpret the information transfer from verbal to non-verbal data and vice-versa

UNIT-I

Definition and Features of Technical communication: Definition, Types and Process of Communication, Definition and features of technical communication (precision, relevance, format, style, use of visual aids), Difference between general writing and technical writing, Types of technical communication.

UNIT-II

Technical Writing-I (Official correspondence): Emails, Business letters (all types), Business proposals, Preparation of Minutes of Meeting.

UNIT-III

Technical writing-II (Reports): Definition, Importance, Types of Report - Memo, Letter & Manuscript, Feasibility report, Project report, Progress report, Evaluation report.

UNIT-IV

Technical writing-III (Manuals): Types of manuals, User manual, Product manual, Operation manual

UNIT-V

Information Transfer and Presentations: Non-verbal (bar diagram, flow chart, pie chart, tree diagram) to verbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

Suggested Readings:

1. Raman, Meenakshi & Sharma, Sangeeta. (2015). Technical Communication: Principles and Practice (3rd Ed.). New Delhi.
2. Rizvi, Ashraf, M. (2017). Effective Technical Communication (2nd Ed.). Tata McGraw Hill Education. New Delhi.
3. Sharma, R. C., & Mohan, Krishna. (2017). Business Correspondence and Report Writing: A Practical Approach to Business &Technical Communication (4th Ed.). Tata McGraw Hill Education. New Delhi.
4. Tyagi, Kavita & Misra, Padma. (2011). Advanced Technical Communication. New Delhi, PHI Learning.

5. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata McGraw-Hill 2009
6. Handbook for Technical Communication by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.

Course Code	Course Title						Core/Elective
U21ME409	**OPERATIONS RESEARCH (Common to CSE, CSD & CSM)**						**---**
Prerequisite	**Hours Per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Basic Mathematics	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

Develop ability to:

1. Explain with examples, the basic terminology of functions, relations, and sets.
2. Perform the operations associated with sets, functions, and relations.
3. Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
4. Describe the importance and limitations of predicate logic.
5. Use Graph Theory for solving problems.

Course Outcomes:

At the end of the course, student would be able to:

1. Understand the ideas of mathematical induction to recursion and recursively defined structures.
2. Prepare the students to have the knowledge of Linear Programming Problem in Operations
3. Research at the end students would be able to understand the concept and develop the models for different applications.
4. Make students understand the concept Replacement models at the end students would able to explain various
   features and applications of replacement models in real time scenario.
5. Prepare the students to understand theory of Game in operations research at the end students would able to explain application of Game theory in decision making for a conflict

UNIT–I

Introduction: Definition and Scope of Operations Research.

Linear Programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method, maximization and minimization, Degeneracy in LPP, Unbounded and, Infeasible solutions.

UNIT–II

Duality: Definition, Relationship between primal and dual solutions, Economic Interpretation, Post optimal of sensitivity analysis, Dual Simplex Method.

UNIT–III

Transportation Models: Finding an initial feasible solution - North West corner method, least cost method, Vogel ‘s Approximation method, Finding the optimal solution, optimal solution by steppingstone and MODI methods, Special cases in Transportation problems - Unbalanced Transportation problem.

Assignment Problems: Hungarian method of Assignment problem, Maximization in Assignment Problem, unbalanced problem, problems with restrictions, travelling sales man problems.

UNIT–IV

Replacement Models: Introduction, replacement of items that deteriorate ignoring change in, replacement of items that deteriorates considering change in money value with time, replacement of items that fail suddenly - Individual replacement policy, Group replacement policy.

Game Theory: Introduction,2-person zero sum games, Maximin-Minimax principle, Principle of Dominance, Solution for mixed strategy problems, Graphical methodfor2xnandmx2games.

UNIT–V

Sequencing Models: Introduction, General assumptions, processing n jobs through 2 machines, processing n jobs through m machines, Processing 2 jobs through m machines

Queuing Theory: Introduction, single channel - Poisson arrivals - exponential service times with infinite population & finite population, multi-channel - poison arrivals - Exponential service times with infinite population.

Introduction to Optimization Techniques: Single objective &Multi objective optimization Techniques like G.A, NSGA, P.Q.O & MPSO Techniques.

Suggested Readings:

1. Hamdy, A. Taha,‖Operations Research-An Introduction‖, Sixth Edition, Prentice Hall of India Pvt. Ltd.,1997
2. S.D. Sharma, OperationsResearch, Kedarnath, Ramnath&Co., Meerut,2009
3. J.B. Gupta, ―Utilization of Electric Power and Electric Traction‖ S.K. Kataria & Sons Publications, 2010 Hrvey M. Wagner, Principles of Operations Research, Second Edition, Prentice Hall of India Ltd.,1980.
4. V.K. Kapoor, OperationsResearch, S. ChandPublishers, NewDelhi,2004
5. R.PaneerSelvam, Operations Research, Second Edition, PHIL earning Pvt. Ltd., New Delhi,2008.

Course Code	Course Title						Core/Elective
U21CS403	**JAVA Programming**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
PPS	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

Develop ability to

1. Understand fundamentals of object-oriented programming in Java which includes
2. defining classes, invoking methods, difference between applet and application programs, using class libraries
3. Create Java application programs using sound OOP practices such as interfaces, exception handling, multi-threading.
4. Understand fundamentals of object-oriented programming in Java.
5. Define classes, invoking methods, difference between applet and application programs, using class libraries
6. Use Collection framework, AWT and event handling to solve real world problems.

Course Outcomes

At the end of the course, student would be able to:

1. Achieve proficiency in object-oriented concepts and also learns to incorporate the same into the Java programming language.
2. Create Java application programs using sound OOP practices e.g., Inheritance, interfaces and proper program structuring by using packages, access control specifiers.
3. Understand and implement the concepts of Exception Handling in JAVA.
4. Develop the ability to solve real-world problems through software development in high-level programming language using Large APIs of Java as well as the Java standard class library.
5. Understand File, Streams, Input and Output Handling in java.

UNIT – I

Object Oriented Programming: Benefits of Object-Oriented Programming.

Introduction to Java: Java buzzwords, bytecode. Java Programming Fundamentals, data types, variables, arrays, operators, expressions, control statements, concepts of classes, objects, constructors, methods, access control, overloading methods and constructors, introducing access control, static, final, exploring string class.

Principles of OOPS: Data Abstraction, Data Encapsulation, Polymorphism, and Inheritance.

UNIT – II

Interfaces: Defining an interface, implementing interfaces, extending interface. **Packages:** Defining, Creating and Accessing a Package, importing packages

Exception handling: Benefits of exception handling, classification, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, built in exceptions, creating own exception subclasses

UNIT – III

Multithreading: Java Thread Model, The Main Thread, creating a Thread, creating multiple threads, using is Alive () and join (), thread priorities, synchronization, inter thread communication, deadlock

Collections: Overview of Java Collection frame work, commonly used Collection classes.

Other Utility classes: String Tokenizes, Scanner Java Input/output: exploring java.io, Java I/O classes and interfaces, File, Stream classes, byte stream, character stream, serialization.

UNIT – IV

GUI Programming with java: The AWT class hierarchy, MVC architecture. Applet Revisited: Basics, architecture and skeleton, simple applet program.

Event Handling: Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. Handling mouse and keyboard events, Adapter classes.

Database Programming using JDBC: Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC.

UNIT – V

Exploring Swing: JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedpane, JScrollPane, JList,JComboBox.

Servlet: Life cycle, using tomcat, simple servlet, servlet API, javax. Servlet package, reading servlet parameters, javax. servlet. http package, handling HTTP requests and responses

Text Books:

1. Herbert Scheldt, "The Complete Reference Java, 7th Edition, Tata McGraw Hill,2006.
2. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning,2002.

Suggested Readings:

1. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th Edition, McGraw Hill Publishing, 2010.
2. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education /PHI.

Course Code	Course Title						Core/Elective
U21CD401	**BASICS OF DATA SCIECNE**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
DBMS	**3**	**1**	**-**	**-**	**40**	**60**	**4**

Course Objectives

Develop ability to

1. To identify the scope and essentiality of Data warehouses and Data Mining.
2. To develop research interest towards advances in data mining.
3. To analyze the data, data science lifecycle, data collection and cleaning, exploratory data analysis and visualization, statistical inference and prediction, and decision-making algorithms for respective applications.

Course Outcomes

At the end of the course, student would be able to:

1. Understand the basic concepts in data science, including real world applications
2. Understand fundamentals of data and Data Mining Principles.
3. To Understand importance of qualitative data, terminologies related to Data Science.
4. Understand and Extract knowledge using data preprocessing concepts in data science.
5. Understand the basics of R Programming environment: R language, R- studio and R packages.

UNIT-I

Introduction to Data Science: Data Science Definition - The Data Science Venn Diagram Terminology Types of Data: - Flavors of Data- Structured and Unstructured Data-Quantitative versus qualitative Data Four Levels of Data- Case study.

UNIT-II Evolutionary of (Five Steps) of Data Science: - Overview of Evolutionary (Five Steps)- Explore the Data Dataset 1 - Dataset2 – Titanic Communication Data: Communication matter- Identifying effective and ineffective visualizations- graphs and statistics Be- Verbal Communication.

UNIT III:

Basics of Data Mining: Importance of Data Mining, moving toward the Information Age Data Mining as the Evolution of Information Technology, What Is Data Mining, What Kinds of Data Can Be Mined, Database Data, Data Warehouses, Transactional Data, Other Kinds of Data, OLTP & Online Analytical Processing (OLAP), Graphs Database.

UNIT IV:

Identification Of Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity: Euclidean, Jaccard's Index & Cosine Similarity

Data Pre-processing: Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization (ETL Operations).

UNIT V:

Introduction to R Programming, getting started with R: Installation of R software and using the interface, Variables and data types, R Objects, Vectors and lists, Operations: Arithmetic, Logical and Matrix operations, Data frames, functions, Control structures, Debugging and Simulation in R.

Text Book:

1. Principles of Data Science, Sinon Ozdemir, Packt Publishing Ltd,2016 (Unit 1& 2).
2. Han, Jiawei, MichelineKamber, and Jian Pei. "Data mining concepts and techniques third edition."The Morgan Kaufmann Series in Data Management Systems 5.4 (2011). (Unit 3 &4).
3. Nina Zumel, Practical Data Science with R, Manning Publications, 2014.

Suggested Readings:

1. SinanOzdemir Principles of Data Science: Mathematical techniques and theory to succeed in datadriven industries, Packt Publishing Limited (13 December 2016).
2. Cielen, Davy, Arno DB Meysman, and Mohamed Ali. Introducing data science: big data, machine learning, and more, using Python tools. Manning Publications Co., 2016.

Course code	**Course title**						Core/Elective
U21EN4L1	**Advanced Communication Skills Lab [CSE, CSD, CIVIL, EEE]**						**Core**
Pre-requisites	**Contact Hours Per Week**				**CIE**	**SEE**	**Credits**
Basic English	**L**	**T**	**D**	**P**			
	-	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

Develop ability to:

1. Improve the students' fluency in English, through Interpersonal Communication skills.
2. Read the given text at normal speed and analyze and evaluate critically.
3. Exhibit their ability and skills relevantly and coherently through resume writing and cover letter writing.
4. Develop oral presentation skills to meet the global competition.
5. Boost confidence through the dynamics of Group Discussion.
6. Prepare all the students for their placements through Mock Interviews.

Course Outcomes:

At the end of the course, student would be able to:

1. Organize ideas relevantly and coherently in their communication.
2. Analyze and comprehend the text inferentially.
3. Write Resume/CV and Cover letter effectively.
4. Practice oral presentations confidently.
5. Participate in group discussion dynamically and face interviews optimistically.

List of Activities:

1. **Activities on Fundamentals of Inter-personal Communication:** Starting a conversation, responding appropriately and relevantly – using the right body language and Role Play in different situations.

2. **Activities on Reading Comprehension:** General Vs. Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading.

3. **Activities on Writing Skills:** Structure and presentation of different types of Resume/CV writing, Cover letter writing, improving one's writing of Resume and Cover letter.

4. **Activities on Presentation Skills**: Oral presentations through JAM, Extempore, Seminars and Poster Presentations.

5. **Activities on Group Discussion and Interview Skills:** a). Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation. b). Concept and Process, Pre-interview planning, opening strategies, answering strategies, interview (Types) and Mock Interviews.

Suggested Readings:

1. Koneru Aruna. (2016). Professional Communication. Tata McGraw-Hill Publishing Company. Ltd, New Delhi
2. Raman, Meenakshi & Sharma, Sangeeta. (2015). Technical Communication: Principles and Practice (3rd Ed.). New Delhi.
3. Anderson Paul V. (2007). Technical Communication. Wadsworth Cengage Learning Pvt. Ltd.
4. Sen Leena. (2009). Communication Skills.PHI Learning Pvt Ltd., New Delhi,
5. Downes Colm. (2008). Job Hunting. Cambridge University Press.

Course Code	Course Title						Core/Elective
U21CS4L1	**JAVA Programming LAB**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
PPS	**-**	**-**	**-**	**3**	**25**	**50**	**1.5**

Course Objectives:

Develop ability to

1. Build software development skills using java programming for real world applications.
2. Implement frontend and backend of an application
3. Create Java application programs using sound OOP practices such as interfaces,exception handling multi-threading.
4. Understand fundamentals of object-oriented programming in Java.
5. Implement classical problems using java programming.

Course Outcomes

After completing this course, the student will be able to:

1. Develop Java applications using the concepts of Inheritance, interfaces, packages, access control specifiers.
2. Implement the concepts of Exception Handling in java Applications.
3. Read and write data using different Java I/O streams.
4. Create graphical user interfaces and Applets by applying the knowledge of Event Handling.
5. Create robust applications using Java standard class libraries and retrieve data from a database with JDBC.

List of Experiments:

1. (a) Write a Java program to illustrate the concept of class with method overloading.
   (b) Write a Java program to illustrate the concept of class with method overriding.

2. (a) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)
   (b) Write a Java program to illustrate the concept of Single level and Multi levelInheritance.

3. (a) write a Java program to demonstrate polymorphism
   (b) Write a Java program to demonstrate the Interfaces & Abstract Classes.

4. (a) Write a Java program to implement the concept of exception handling.
   (b) Write a Java program to illustrate the concept of threading using Thread Classand runnable Interface.

5. (a) Write a Java program to illustrate the concept of Thread synchronization.

6. (a) Write a Java program that correctly implements producer consumer problemusing the concept of inter thread communication.
   (b) Write a Java program that reads a file name from the user, and then displays inform action about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

7. (a) Write a Java program to illustrate the concept of I/O Streams

(b) Write a Java program to implement serialization concept

8. (a) Write a Java applet program to implement Colour and Graphics class
   (b) Write a Java applet program for handling mouse & key events

9. (a) Write a Java applet program to implement Adapter classes
   (b) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field todisplay the result.

10. (a) Write an example for JDBC prepared statement with ResultSet
    (b) Write a Java Program to get primary key value (auto-generated keys) frominserted queries using JDBC

11. (a) Write a Java Program to create a simple JList
    (b) Write a Java Program to create a simple checkbox using JCheckBox

12. (a) Write a Java Program to create a checkbox and Item Listener to it.
    (b) Write Servlet application for following
        i. Html & Servlet Communication
        ii. Auto refresh a page
        iii. Demonstrate session tracking
        iv. Select record from database
        v. Application for login page
        vi. Insert record into database
        vii. Count the visits on webpage
        viii. Insert teacher record in Database

Suggested Readings:

1. Herbert Scheldt, “The Complete Reference Java, 7th Edition, Tata McGraw Hill,2006.
2. James M Slack, Programming and Problem Solving with JAVA, Thomson Learning,2002.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th Edition, McGraw Hill Publishing,2010.
4. H. M. Dietel and P. J. Dietel, Java How to Program, Sixth Edition, Pearson Education.

Course Code	Course Title						Core/Elective
U21CD4L1	**Data Science Using R lab**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
DBMS			**-**	**3**	**25**	**50**	**1.5**

Course Objectives

Develop ability to

1. Understand the R Programming Language.
2. Exposure on solving of data science problems.
3. Understand the classification and Regression Model.

Course Outcomes

After completing this course, the student will be able to:

1. After completing this course, the student will be able to:
2. Work with Data Science using R Programming environment
3. Implement various statistical concept like linear and logistic regression
4. Perform Classification and Clustering using appropriate dataset
5. Implement various statistical concept like linear and logistic regression

List of Experiments:

1. CALCULATOR APPLICATION

a) Using with and without R objects on console
b) Using mathematical functions on console
c) Write an R script, to create R objects for calculator application and save in a specified location in disk

2. DESCRIPTIVE STATISTICS IN R

a) Write an R script to find basic descriptive statistics using summary
b) Write an R script to find subset of dataset by using subset ()

3. READING AND WRITING DIFFERENT TYPES OF DATASETS

a) Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
b) Reading Excel data sheet in R.
c) Reading XML dataset in R.

4. VISUALIZATIONS

a) Find the data distributions using box and scatter plot.
b) Find the outliers using gplot.
c) Plot the histogram, bar chart and pie chart on sample data

5. CORRELATION AND COVARIANCE

a) Find the correlation matrix.
b) Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
c) Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data

6. REGRESSION MODEL

a) Import a data from web storage.
b) Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student.
c) Check the model is fit or not. require (foreign), require (MASS).

7. Build CLASSIFICATION MODEL using KNN algorithm

a) Install relevant package for classification.
b) Choose classifier for classification problem.
c) Evaluate the performance of classifier.

8. Build CLUSTERING MODEL using K-mean algorithm

a) Clustering algorithms for unsupervised classification.
b) Plot the cluster data using R visualizations.