# NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA,G.B. NAGAR (AN AUTONOMOUS INSTITUTE)



#### **Affiliated to**

#### DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW



## **Evaluation Scheme & Syllabus**

For

**Bachelor of Technology** 

**Computer Science and Engineering (Data Science)** 

**Second Year** 

(Effective from the Session: 2025-26)

# NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR (AN AUTONOMOUS INSTITUTE)

# Bachelor of Technology Computer Science and Engineering (Data Science)

## $\underline{\textbf{EVALUATION SCHEME}}$

#### **SEMESTER-III**

Sl. No.	Subject	Subject	Types of	Per	riods		Eva	luatio	n Scheme	S		nd ester	Total	Credit
	Codes	· ·	Subjects	L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSCC0301	Employability Skill Development - I	Mandatory	2	0	0	60	40	100				100	2
2	BAS0303N	Statistics and Probability	Mandatory	3	1	0	30	20	50		100		150	4
3	BCSE0303A	Operating Systems	Mandatory	2	0	0	30	20	50		50		100	2
4	BCSE0301	Data Structures and Algorithms-I	Mandatory	3	0	0	30	20	50		100		150	3
5	BCSDS0301N	Foundations of Data Science	Mandatory	2	0	0	30	20	50		50		100	2
6	BCSAI0304	High Performance Computing	Mandatory	3	0	0	30	20	50		100		150	3
7	BCSE0353A	Operating Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BCSE0351	Data Structures and Algorithms-I Lab	Mandatory	0	0	4				50		50	100	2
9	BCSDS0351	Foundations of Data Science Lab	Mandatory	0	0	2				25		25	50	1
10	BCSE0352	Object Oriented Techniques using Java	Mandatory	0	0	6				50		100	150	3
11	BCSE0359X	Social Internship	Mandatory	0	0	2				50			50	1
12	BNC0302Y/	Environmental Science /	Compulsory	2	0	0	30	20	50				50	NA
	BNC0301Y	Artificial Intelligence and Cyber Ethics	Audit											
		Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL		17	1	18	210	140	350	225	400	225	1200	25

#### \* List of MOOCs Based Recommended Courses for Second year (Semester-III) B. Tech Students

Sr. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0010	Comprehensive Training on Unix and Linux OS Fundamentals	Infosys Wingspan (Infosys Springboard)	30h 13m	2.5
2	BMC0009	Probability and Statistics using Python	Infosys Wingspan (Infosys Springboard)	16h	1

#### **PLEASE NOTE: -**

- A 3-4-week Internship shall be conducted during summer break after semester-II and will be assessedduring semester-III.
- Compulsory Audit (CA) Courses (Non-Credit BNC0301Y/BNC0302Y)
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - > The total and obtained marks are not added to the grand total.

#### **Abbreviation Used:**

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

# NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR (AN AUTONOMOUS INSTITUTE)

## Bachelor of Technology Computer Science and Engineering (Data Science)

## **Evaluation Scheme**

#### **SEMESTER-IV**

Sl. No.	Subject	Subject	Types of	P	erio	ds	Ev	aluati	ion Schem	es		nd ester	Total	Credit
	Codes		Subjects	L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BASCC0401	Employability Skill Development - II	Mandatory	2	0	0	60	40	100				100	2
2	BCSE0402	Database Management Systems	Mandatory	3	0	0	30	20	50		100		150	3
3	BCSE0401	Data Structures and Algorithms-II	Mandatory	3	0	0	30	20	50		100		150	3
4	BCSML0401	Machine Learning	Mandatory	3	0	0	30	20	50		100		150	3
5	BASL0401N	Technical Communication	Mandatory	2	0	0	30	20	50		50		100	2
6		Department Elective - I	Departmental Elective	3	0	0	30	20	50		100		150	3
7	BCSE0452Z	Database Management Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BCSE0451	Data Structures and Algorithms-II Lab	Mandatory	0	0	2				25		25	50	1
9	BCSE0455	Web Technologies	Mandatory	0	0	6				50		100	150	3
10	BCSE0459	Mini Project	Mandatory	0	0	2				50			50	1
11	BCSCC0452	Problem Solving Approaches	Mandatory	0	0	2				50			50	1
12	BNC0401Y/ BNC0402Y	Artificial Intelligence and Cyber Ethics/ Environmental Science	Compulsory Audit	2	0	0	30	20	50				50	NA
		Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL		18	0	16	210	140	350	225	450	175	1200	24

#### \* List of MOOCs Based Recommended Courses for Second year (Semester-IV) B. Tech Students

S. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0039	Comprehensive Data Analytics Bundle	Infosys Wingspan (Infosys Springboard)	8h 53m	0.5
2	BMC0038	Implementing databases using Microsoft SQL Server	Infosys Wingspan (Infosys Springboard)	30h 52m	2.5

#### **PLEASE NOTE: -**

- Compulsory Audit (CA) Courses (Non-Credit BNC0401Y/BNC0402Y)
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - > The total and obtained marks are not added to the grand total.

#### **Abbreviation Used:**

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

## **DEPARTMENTAL ELECTIVES**

Subject Code	Subject Name	Туре	Sem	Branch	Bucket
BCS0411	Introduction to Cloud Computing	Departmental Elective- I	Cloud Computing Bucket	CSE (DS)	4
BCSCY0411	Fundamentals of Cybersecurity	Departmental Elective- I	Cyber Security – I Bucket	CSE (DS)	4
BCSDS0412	Business Intelligence and Data Visualization	Departmental Elective- I	Data Analytics	CSE (DS)	4
BCSE0411	Python Web development with Django	Departmental Elective- I	Full Stack Development	CSE (DS)	4

## NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR (AN AUTONOMOUS INSTITUTE)

A student will be eligible to get Undergraduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

- 1. For 6 to 12 Hours = 0.5 Credit
- 2. For 13 to 18 = 1 Credit
- 3. For 19 to 24 = 1.5 Credit
- 4. For 25 to 30 = 2 Credit
- 5. For 31 to 35 = 2.5 Credit
- 6. For 36 to 41 = 3 Credit
- 7. For 42 to 47 = 3.5 Credit
- 8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

- i. If he / she secures 7.50 as above CGPA.
- ii. Passed each subject of that degree program in the single attempt without any grace.
- iii. Successful completion of MOOCs based 20 credits.



### **GREATER NOIDA-201306**

(An Autonomous Institute)

School of Computer Science in Emerging Technologies
me: Employability L T P C

Course Cod	ourse Code: BCSCC0301								ty	L	T	P	С		
				Skil	l Deve	elopmo	ent – I								
~ ~ ~															
Course Offe										2	0	0	2		
Pre-requisi															
Course Obj									•	•					
and software		_	_	_	_		-		-			_		_	
practice and applications				•			• •		_					eating re	al-world
											Doranive	compe		m'sKnov	vledge
<b>Course Outcome:</b> After completion of the course, the student will be able to													Leve		v 10 ago
CO1				App	•	, relati	ons, fu	nction	s to co	mputat	ional pr	oblem-	К3		
		Und	erstanc	ent th	e steps	in the s	software	e							
CO2 development life cycle using logical in											ing and		K3		
flowcharts.															
CO3 Design and develop small-scale software projects or game using structured programming and project-based											r games				
CO3					-	_	orograi	mming	g and p	roject-t	asea		K6		
approaches.  Collaborate in teams to plan, develop, and present a															
Collaborate in teams to plan, develop, and present a complete software project, demonstrating problem-solving												K6			
				1		unicati				т. В Р		501,1116			
CO-PO Ma	pping (	Scale 1	1: Low										I		
СО-РО					- o -							7001	500	PSO3	
Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	POIO	POII	PSO1	PSO2		
CO1	3	3	2	2	-	-	-	2	-	-	-	2	-	1	
CO2	3	3	3	2	-	-	-	2	-	-	-	-	3	2	
CO3	3	3	3	2	-	-	-	2	-	-	-	-	-	3	
CO4	3	3	3	3	-	-	-	2	-	-	-	-	-	-	
Course Cor	ntents / :	Syllab	us												
Module 1										ons of	-		hours		
									tems	tical C		ind			
Computer	System	Funda	ament	als: In	troduc	tion to	Asse						of Load	ler and L	inker in
program exe	•								, ,	,	Ι	,			
Mathematic		ndatio	ns for	Comp	outing	: Sets,	Relati	ons, a	nd Fur	ections:	definiti	ons and	applicat	ions, Pri	nciple of
Mathematic	al Induc	tion ar	ıd its u	se in p	roofs.										
Module 2									tware idame		velopm	ent 6	hours		
Introduction				•			•	•	•			•	•	ms, De	veloping
logic/flowch	nart/pseu	idocod	e, sim	ple gar	nes, pi	uzzles,	Step-								
Module 3								Pro	ject-B	ased L	earning	g   10	hours		

Introduction to the basics of C++, Implementation of control structures through practical tasks such as creating a number guessing game using loops and conditions, Functions and scope demonstrated by developing a menu-driven applications using user-defined functions, implement simple logic-based games including puzzles, tic-tac-toe, Hangman etc., the concept of pointers and dynamic memory allocation is introduced by creating a dynamic leader board to store player scores. File handling in C++ to save high scores or game states to external files.

Module 4	Project/Game	10 hours
	Development	

Project Planning & Development (Teams, roles, idea pitching, develop C++ game or simulation), Mini Project, Project Demonstration and Review

	Total Lectures: 30 hours
Reference Books:	
S.No	Book Title
1	BajarneStroustrap ,Programming: Principles and Practice Using C++,
	2 <sup>nd</sup> Edition
2	Scott Meyers, Effective Modern C++, Shroff/O'Reilly
NPTEL/ YouTube/ Faculty Video Link:	
1	
2	

#### **Mode of Evaluation**

			CIE		ESE	Total		
ST1	ST2	ST3	TA1	TA2	TA3	Attendance		
			10	10	10	10		
60 40								100
			•					



### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

Course Code: BAS0303N																
	Code: B						ne: Stat	tistics a	nd Pro	bability			L	T	P	C
Course	Offered	in: B.T	Tech. Se	econd Y	ear Ser	n-III				-			3	1	0	4
AI/AIM	IL/AI(T	WIN)/A	AIML(	TWIN)/	CYS/D	S/CS/C	SE/CSI	E-R/IT/	M.Tecl	h(Int.)/I	T					
(TWIN	)/CSE(T	WIN)														
Pre-req	uisite: E	B.Tech.	Ist Yea	r Syllal	ous											
Course	Objecti	ves: The	e object	ive of th	nis cour	se is to	familiar	ize the	students	with co	ncepts o	f Probab	ility	and s	statist	tical
techniqu	ies. It air	ns to eq	uip the	student	s with a	dequate	Knowl	edge of	statistic	es that w	ill enabl	e them in	n forr	nulat	ting	
Problem	ns and so	lving pr	oblems	analyti	cally.	-										
Course	Outcom	e: Afte	r compl	etion of	the cou	rse, the	student	will be	able to				Bloc	m's		
			•										Kno	wled	ge Le	evel
													(KL	)		
CO1	Apply the concept of moments, skewness and kurtosis in relevant field.												. ,		3	
CO2										eal worl	d proble	ms.		K	<b>K</b> 3	
CO3	Apply t	the conc	cept of p	probabil	ity and	random	variable	e.						K	<b>K</b> 3	
CO4	Apply the concept of Mathematical Expectations and Probability Distribution in real life problems.													K	Κ3	
CO5	Apply the concept of hypothesis testing and statistical quality control to create control													K	<b>C</b> 3	
	charts.															
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)																
CO-	)-															
PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	DO11	DSO1	DC	<b>O2</b>	D	<b>SO3</b>
Mapp ing		102	103	104	103	100	107	108	109	1010	1011	1301	18	002		<del>,</del>
CO1	3	2	2	3	1	1	-	1	2	2	2	3		1		1
CO2	3	2	2	3	1	1	-	1	2	2	2	3		2		2
CO3	3	2	1	2	-	-	-	-	1	2	2	2		1		1
CO4	3	2	2	3	1	1	-	1	2	2	2	3		2		2
CO5	3	2	2	3	1	1	-	1	2	2	2	3		2		2
Course	Content	ts / Sylla	abus							•						
Module				Statistic	al Tech	niques	-I								6 hou	irs
Introduc	ction: M	eacures	of cen	tral ten	dency	Mean 1	Median	Mode	Stande	ard devi	ation C	nartile o	levio	ion	Mor	nent
	ss, Kurto		or cen	trar ten	deficy.	ivican, i	viculali,	, ivioue,	, Standa	aru uevi	ation, Q	quarine (	ieviai	.1011,	WIOI	nent,
Module	2			Statistic	al Tech	niques	-II								10 ho	ours
	itting, M					•	_		_					nenti	al cu	rves,
Module	3		]	Probabi	lity and	l Rando	om Var	iable						]	10 ho	urs
Random	Variabl	e: Defir	nition of	f a Rand	lom Var	riable. D	Discrete	Randor	n Varia	ble, Con	tinuous	Random	Varia	able.		
	lity mass													,		
11000011	111030	. 10110110	, . 100	acinty 1	- 01151ty	_ 0110110	,1011	-544011	- 0110110							

Multiple Random Variables: Joint density and distribution Function, Properties of Joint Distribution function, Marginal density Functions, Conditional Distribution and Density, Statistical Independence, Central Limit Theorem (Proof not expected). Module 4 **Expectations and Probability Distribution** 10 hours Expectations of single Random Variable, Mean, Variance, Moment Generating Function, Binomial, Poisson, Normal, Exponential distribution Module 5 **Hypothesis Tests and Control Charts** 12 hours Testing a Hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Z-test, t-test and Chi-square test, F-test, One way ANOVA. Statistical Quality Control (SQC), Control Charts, Control Charts for variables (Mean and Range Charts), Control Charts for Variables (p, np and C charts). Total Lecture Hours 48 hours **Textbook: Book Title** S.No **Author** Textbook of Engineering Mathematics- IV 1 Bali, N.P. 2 Advanced engineering mathematics Jain, R.K. Higher engineering mathematics 3 Grewal, B.S. 4 Statistical methods Gupta, S.P. 5 Advanced engineering mathematics ZILL, DENNIS G. **Reference Books:** S.No **Book Title** Author 1 Introduction to Probability Models Ross, Sheldon M 2 Probability, Random Variables and Stochastic Processes Papoulis, Athanasios 3 Advanced engineering mathematics Kreyszig, E. NPTEL/ Youtube/ Faculty Video Link: Module 1 https://archive.nptel.ac.in/courses/110/107/110107114/ Module 2 https://archive.nptel.ac.in/courses/111/105/111105042/ https://archive.nptel.ac.in/courses/117/105/117105085/ Module 3 https://archive.nptel.ac.in/courses/111/104/111104032/ Module 4 http://www.digimat.in/nptel/courses/video/111106112/L19.html https://youtu.be/qvUT68tG bo?si=40-T46aZ8TmQ-wsG

#### **Mode of Evaluation**

Module 5

			ESE	Total				
ST1	ST1 ST2 ST3 TA1 TA2 TA3 Attendanc							
			5	5	5	e		
						5		
	30			2	20	100	150	

https://archive.nptel.ac.in/courses/103/106/103106120/



#### **GREATER NOIDA-201306**

(An Autonomous Institute)
School of Computer Science in Emerging Technologies

CourseCode: BCSE0303	CourseName: Operating Systems	L	T	P	С
CourseOfferedin:CSE/CSE-R/	TT/CS/AI/AIML/IOT/DS/CYS	2	0	0	2

**Pre-requisite:** Basic knowledge of computer fundamentals, Cprogramming, Datastructure and Computer organization.

**CourseObjectives:** The objective of the course is to provide a foundational understanding of operating system concepts, including system architecture, process and thread management, concurrency, deadlock, resource management, memoryandfilesystems, Linux shells cripting, and an introduction to virtualization and distributed systems.

CourseOutcome: Aftercompletion of the course, the student will be able to					
		Level(KL)			
CO1	Understand operating system architectureand types, and use the Linux CLI for basic Operations.	K2			
CO2	Implement the CPU scheduling algorithms including uses of multithreading models.	K4			
CO3	Implement concurrency control, process synchronization techniques, and deadlock handling techniques	K4			
CO4	Implement memory management strategies and page replacement algorithms to optimize system performance.	K4			
CO5	Analyze file systems and configure distributed systems and virtual machines in modern operating systems.	K4			

CO-POMapping(Scale1:Low,2:Medium,3:High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	0	0	0	0	1	1	3	1	1
CO2	3	3	3	2	2	0	0	0	0	1	1	3	2	2
CO3	3	3	3	2	2	0	0	0	0	1	1	2	1	1
CO4	3	3	3	2	2	0	0	0	0	1	1	3	2	2
CO5	3	2	3	2	2	0	0	0	0	1	2	3	2	2

CourseContents/ Syllabus

Unit 1 Fundamentals&Shellscripting 04 hours

**Fundamentals of Operating Systems** Overview of Operating Systems, Generations of OS, Operating system architecture, Interrupt handling, System call and kernel, Types of Operating System: Batch OS, MultiprogrammingOS, MultitaskingOS, Multiprocessor OS, Realtime OS.

**ShellScriptinginLinux**IntroductiontoLinuxOperatingSystem&Architecture,BasicCommandLineInterface (CLI)Operations inLinux,ShellScriptingBasics:Variables,ControlStructures,Functions

**Applications:** Automating system administration tasks using shell scripts in Ubuntu/Linux (e.g., backup scheduling).

Unit 2	Process&Thread Management	08 hours
ProcessManagement:-F	Process, Transition Diagram, Process Control Block (PC)	B), Types of Schedulers: Long Term,

Mid Term, Short Term Scheduler,

**CPUScheduling**-Pre-emptiveandNon-Pre-emptiveAlgorithm(FCFS,SJF,SRTF,Non-Pre-emptivePriority, Pre-emptivePriority,RoundRobin,MultilevelQueueSchedulingandMultilevelFeedbackQueueScheduling)

**Thread:-**Processes VsThreads, Threadstates, Benefits of threads, Types of threads, Multithread Model, Concept of Hyper-Threading

**Applications:** AnalyseandimplementCPU SchedulinginReal-TimeEmbeddedSystemsand RTOS

Unit 3 ConcurrencyandDeadlockManagement 08 hours

**Concurrency:** Introduction of Concurrency, Types of Process, Race Condition, Critical Section, Inter Process Communication, Producer consumer problem.

**ProcessSynchronization**:Lockvariable,Peterson'sSolution,Strictalternation,LamportBakerySolution,Test and set lock, Semaphore- counting, binary and monitor,

ClassicalProblemofSynchronization:-BoundBuffer,DinningPhilosopher,Readerwriter,Sleepingbarber.

**Deadlock:** Deadlock, Deadlock characterization, Deadlock Prevention, Deadlock Avoidance: Bankers Algorithms, Deadlock Detection, Recovery from Deadlock.

**Applications:** DeadlockavoidanceindatabasetransactionmanagementsystemslikeOracleorMySQL.

Unit 4 MemoryManagement 08 hours

**Memory Management:** -Memory Management function, Loading and linking Address Binding, Memory management techniques, Contiguous technique- Fixed Partitions, variable partitions, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Non-contiguous, Paging, Segmentation, Segmented paging,

 $\label{lem:lemony} \textbf{Virtual Memory Concepts, Demand Paging, Performance of Demand Paging, Page}$ 

ReplacementAlgorithms:FIFO,LRU,OptimalandLFU,Belady'sAnomaly,Thrashing

**Applications:** Virtual memory management in modern OS like Windows 10 and how paging impacts performance.

Unit 5 FileManagement&ModernOperatingSystem 04 hours

FileManagement: Access Mechanism, File Allocation Method, Free Space Management: Access Mechanism, File Allocation Method, Free Space Method, Free

-BitVector, Linked List,

**DISK:** DiskArchitecture, HDDvs SSD, DiskScheduling Algorithms

**Modern Operating System:** -Overview of modern operating system, Modern OS features: Multitasking, virtualization, security, scalability, Shared Memory concepts, Distributed system, Parallel system & its architecture, Virtual machines – hypervisor, Introduction to GPU

**Applications:** LargeFileStorageinaDistributedManner.

	TotalLecture Hours 32 hours
Textbo	ook:
1	AbrahamSilberschatz,PeterBaerGalvinandGregGagne" OperatingSystem ConceptsEssentials", WilleyPublication,10thEdition,2018.
2	MarksG.Sobell"ApracticalguidetoLinux:Commands,EditorsandShellProgramming",CreateSpaceIndependentPublishingPlatform,4 <sup>th</sup> Edition,2017.
3	JasonCannon"LINUXforbeginners",1stEdtion,2014
Refere	nce Books:
1	William Stallings "Operating Systems: Internals and Design Principles", Pearson Education, 9th Edition, 2019.
2	Charles Patrick Crowley, "Operating System: A Design-oriented Approach", McGraw Hill Education ,2017.
3	Ganesh Naik "Learning Linux Shell Scripting", Packt Publishing ,2nd Edition 2018.

NPTEL/ Y	outube/ Faculty Video Link:
Unit1	CS162Lecture1:WhatisanOperatingSystem?(youtube.com) OperatingSystem#01IntroductiontoOS,itsRoles&Types(youtube.com) Operating System #14 What is an Interrupt? Types of Interrupts - YouTube https://www.youtube.com/watch?v=akU1Ji8Vzdk&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ https://www.youtube.com/watch?v=rRGCGZ6OHw8&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ&index=2
Unit2	Operating System #18 CPU Scheduling: FCFS, SJF, SRTF, Round Robin - YouTube Operating System #19 Priority Scheduling Algorithms, Multilevel Queues - YouTube Operating System #20 Multi Processor Scheduling (youtube.com) Operating System #33 Threads: ThreadModel, Threadvs Process, pthreadlibrary(youtube.com) Operating System #34Threads: Userlevel&Kernellevelthread, Threadingissues(youtube.com) https://www.youtube.com/watch?v=3eG27YUbzyM&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ&index=3
Unit3	CS162:Lecture6:Synchronization1:ConcurrencyandMutualExclusion(youtube.com) CS162: Lecture 6.5: Concurrency and Mutual Exclusion (Supplemental) (youtube.com) OperatingSystem#04CPUSharing,RaceConditions,Synchronization,CPUScheduling(youtube.com) OperatingSystem#26 Bakery Algorithm - YouTube OperatingSystem#27HardwareLocks:Spinlock&itsUsage(youtube.com) OperatingSystem#31Deadlocks:DeadlockDetection&Recovery(youtube.com)
Unit4	OperatingSystem#05MemoryManagement:Process,Fragmentation,Deallocation,(youtube.com) Operating System #06 Virtual Memory & Demand Paging in Operating Systems (youtube.com) OperatingSystem#07MMUMapping How VirtualMemoryWorks?—YouTube
Unit5	https://www.youtube.com/watch?v=qbQCQ0U6H0ohttps://www.youtube.com/watch?v=SnK gEuUfV4k https://www.youtube.com/watch?v=cVFyK1f5lDw https://www.youtube.com/watch?v=Z0Vkrn9faoM&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cv Q&index=4 https://www.youtube.com/watch?v=_BtDcroOTSA CUDAProgrammingCourse—High-PerformanceComputingwithGPUs

### ModeofEvaluation

	ESE	Total					
ST1	ST2	ST3	T	TA	Attendanc		
			<b>A1</b>	2	e		
			5	5	10		
	30			20	50	100	



## **GREATER NOIDA-201306**

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Name: Data Structures and Algorithms-I

Course	Code: BO	CSE030	1		Course	Name	: Data	Struc	tures a	nd Algo	orithms	-I	L	T	P	C
Course Offered in: CSE/CS/CS/IT/CSE(AI)/CSE(AIML)/CSE															0	3
	uisite: Th						age									
	Objective		pt of I	Togran		Danga	uge.									
	ective of t		se is to	learn	the bas	ic cond	cepts o	f algor	ithm ar	nalysis, a	along wi	th the in	npleme	entat	ion of 1	ine
data stru	cture.												1			
Course	Outcome	: After	comple	etion o	of the co	ourse, t	he stud	dent wi	ll be al	ole to:						
S. No		Course	Outco	ma										RI	loom's	
3.110	,	Course	Outco	лис											evel	
CO1	Understa	and the	concep	ot of al	gorithn	n analy	sis and	l its im	portan	ce for pr	oblem s	olving.			K2	<u></u>
CO2	Impleme	ent array	ys for s	searchi	ng, sor	ting, ar	nd hasł	ning to	foster	critical t	hinking.				K3	<del></del>
CO3	Compare		ontrast	linked	l list w	ith arra	ays and	l the in	npleme	entation	of linke	d list wi	th thei	r	K4	<del></del>
CO4	CO4 Apply the concept of Stacks and Queues to implement Linear Data Structures and solve real-world computational problems.					K3	}									
CO5	Impleme	-solving	g acros	s diver	rse con	text.		orithm	and g	reedy a	oproach	es for e	fficien	ıt	K4	1
CO-PO CO-PO	Mapping	g (Scale	: 1: La	ow, 2:	Mediu	m, 3: 1	High)									
Mappii	1 1/1 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO	2	PSO	3
CO1	3	3	2	3	3	1	1	1	1	1	2	1	1		1	
CO2	3	3	2	2	3	1	1	1	1	1	2	3	1		2	
CO3	3	3	2	2	3	1	1	1	1	1	2	3	1		2	
CO4	3	3	3	2	3	1	1	1	1	1	2	3	1		2	
CO5	3	3	3	3	3	1	1	1	1	1	3	3	1		2	
Course	Contents	/ Sylla	bus											•		
Unit 1				Int	roduct	ion to	Data S	Structu	re and	d Algori	thms				1(	
solving I Big Oh Data typ	ms, Analy Recurrence, Big Theores: Primit uctures.	es, Perta and B	forman Big Om	nce Me nega), A	easuren Abstrac	nents, 7 et Data	Гime a Types	nd Spa (ADT)	ce Con	nplexity	of an al	gorithm	, Asyn	npto	Metho tic nota	tio
Data Str																

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of Arrays: Sparse Matrices and their Representations.

Searching algorithm with analysis: Linear search, Binary search. Sorting algorithm with analysis: Bubble sort, Insertion sort, Selection sort, Shell Sort, sorting in Linear Time- Counting Sort.

Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, Hashing for direct files.

	·	
Unit 3	Design and Analysis of Algorithms: Linked lists Data Structure	10
		hours

Comparison of Array, List and Linked list Types of linked list: Singly Linked List, Doubly Linked List, Circular Linked List Polynomial Representation and Addition of Polynomials.

Unit 4	Design and Analysis of Algorithms: Stacks Data Structure, Recursion	10
	and Queue Data Structure	hours

Primitive Stack operations: Push & Pop, Array and Linked List Implementation of Stack, Application of stack: Infix, Prefix, Postfix Expressions and their mutual conversion, Evaluation of postfix expression.

Principles of recursion, Tail recursion, Removal of recursion, Problem solving using iteration and recursion with examples such as binary search, Fibonacci series, and Tower of Hanoi, Trade-offs between iteration and recursion.

Merge sort and Quick sort algorithms with analysis.

Array and linked List implementation of queues, Operations on Queue: Create, Insert, Delete, Full and Empty, Circular queues, Dequeue and Priority Queue algorithms with analysis

Unit 5	Design and Analysis of Algorithms: Divide and Conquer Algorithm	9
	and Greedy Algorithms	hours

Divide and Conquer concepts with Examples Such as Quick sort, Merge sort.

Greedy Methods with Examples Such as Activity Selection, Task Scheduling, Fractional Knapsack Problem, Huffman Encoding.

Total Lecture Hours	48
	hours

#### **Textbook:**

- 1. Michael T. Goodrich, Roberto Tamassia, "Data Structures and Algorithms in Python: An Indian Adaptation", 1st Edition, 2021.
- 2. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd, 2nd Edition, 2017.
- 3. Horowitz and Sahani, "Fundamentals of Data Structures", Computer Science Press, 1st Edition, 1993.

#### **Reference Books:**

- 1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, 4th ed. Cambridge, MA, USA: MIT Press, 2022.
- 2. N. Karumanchi, Data Structures and Algorithms Made Easy: Data Structure and Algorithmic Puzzles, 5th ed. Noida, India: CareerMonk Publications, 2016.
- 3. A. Y. Bhargava, Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People, 2nd ed. Shelter Island, NY, USA: Manning Publications, 2024.
- 4. R. Sedgewick and K. Wayne, Algorithms, 4th ed. Boston, MA, USA: Addison-Wesley, 2011.
- 5. S. S. Skiena, The Algorithm Design Manual, 2nd ed. London, U.K.: Springer, 2011.

NPTEL/ YouTube/ Faculty Vid	NPTEL/ YouTube/ Faculty Video Link:					
Unit 1	https://youtu.be/u5AXxR4GnRY					
Unit 2	https://www.youtube.com/watch?v=LQx9E2 p5c&pp=ygUMYXJyYXlzIG5wdGVs					
Unit 3	https://www.youtube.com/watch?v=K7VIK1Udo20&pp=ygUPbGluayBsaXN0IG5wdGVs					

Unit 4			<u>h</u>	ttps://wv	vw.youtube.cor	n/watch?v=g	1USSZVWDsY&list=PLB3CD0BBB95C1B					
			<u> </u>	09&inde	ex=2&pp=iAQl	<u>B</u>						
https://www.youtube.com/watch?v=THMyk2_p530&pp=ygUccXVldWUgZGF0Y												
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Unit 5			<u>h</u>	VV9v41FIq0&pp=ygUZZGl2aWRlIGFuZCB								
			il	b25xdW	VyICBucHRlb.	A%3D%3D						
			h	ttps://wv	vw.youtube.cor	n/watch?v=A	ARvQcqJNY&list=PLfFeAJ-					
			_	_	XlayyvDFL_n							
Mode of	Evaluat	ion:										
			CIE			ESE	Total					
ST1	ST2	ST3	TA1	TA2	Attendance							
			(5)	(5)	(10)							
11												



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

Course Code: BCSDS0301N	<b>Course Name: Foundations of Data Science</b>	L	T	P	C
Course Offered in: CSE(DS)		2	0	0	2

**Pre-requisite:** BasicsofStatistics,PythonandRProgramming

**Course Objectives:** This course aims to understand the fundamental concepts of Data Science and learn about various types

ofdataformatsandtheirmanipulations.Ithelpsstudentstolearnexploratorydataanalysisandvisualizationtechniquesinadditionto R programminglanguage.

Course	Outcome: After completion of the course, the student will be able to	Bloom's
		Knowledge Level (KL)
CO1	Understand the core conceptsand tools of data science, big data, and data warehousing for analytical decision-making.	K2
CO <sub>2</sub>	Explain and exemplify common data types and representation, while exploring modern trends and techniques in data science.	K4
CO <sub>3</sub>	Illustrate data pre-processing techniques using R.	K3
CO <sub>4</sub>	Evaluate various visualization methods for different types of data sets and application scenarios.	K5

#### CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mappin g	PO1	PO2	PO3	PO4	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	PO8	PO9	<b>PO10</b>	<b>PO11</b>	PSO1	PSO 2	PSO3
CO <sub>1</sub>	2	1	1	1	1	0	0	0	1	0	1	3	2	1
CO <sub>2</sub>	3	2	2	2	2	1	2	1	1	0	1	3	<mark>3</mark>	2
CO <sub>3</sub>	2	3	2	3	3	1	0	0	1	0	1	2	<mark>3</mark>	1
CO <sub>4</sub>	2	3	2	3	3	0	0	0	0	2	1	2	<mark>3</mark>	2

**Course Contents / Syllabus** 

Module 1 Introduction to Data Science 8hours

Introduction to Data Science, Big Data, the 5 V's, AnalysisVsAnalyticsVsReporting,BigDataEcosystem,Future of Data Science, Applications of Data Science invarious fields, Crowd sourcing analytics, Data

Security Issues, distinguishing between BI, ML, and AI, Applying Traditional Data, Big Data, BI, Traditional Data Science, and ML.

Data Warehousing (Overview, Motivation, Definition&Functionalities), DataWarehousingarchitecture, Difference between DBMS and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars,

Snow flakes, Fact Constellations, Warehouse Schema Design, Aggregation, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP.

DataScienceTrends-UseCases:PredictingCustomer Behavior,FraudDetectioninFinance.

Use cases of Data Science-Facebook, Netflix, Amazon, Uber, AirBnB.

Module 2 Data Pre-processing 7 hours

Data Analyst Job Description with (SQL, Excel, Python), Typesof Data: structured, semi-structured, unstructured data, Numeric, Categorical, Graphical, High Dimensional Data, Transactional Data, Spatial Data, Social Network Data, standard datasets, Data Classification, Sources

of Data, Data manipulation in various for mats, for example, CSV file, pdffile, XML file, HTML file, textfile, JSON, image file setc. important dexport data in R/Python.

Understanding Emerging Trends in Data Science: AutoML, GenerativeAI, MLops, LLMs, CloudComputing.

Data Pre-processing: Form of Data Pre-processing, whypre-

processthedataAttributeanditstypes,understandingandextractingusefulvariables.

DataCleaning:MissingValues,NoisyData, (Binning,Clustering,Regression),InconsistentData,DataIntegration and Transformation. Data Reduction: DataCube Aggregation,

Dimensionality reduction, DataCompression,

Numerosity Reduction, Discretization and Concepthierarchygeneration.

Data Mining, KDDProcessindatamining.

Module 3 Exploratory Data Analysis 6 hours

(Using R Packages) Handling Missing Data, Data

Cleaning, Removing Redundant variables, variable Selection, identifying outliers, Removing Outliers, Time series Analysis, Data transformation and dimensionality reduction techniques such as Principal Component Analysis (PCA), Factor Analysis (FA) and Linear Discriminant Analysis (LDA), Univariate and Multivariate Exploratory Data Analysis. Data Munging, Data Wrangling- APIs and other tools for scraping data from the web/internet using R/Python, Messy Data.

Module 4 Data Visualization 9 hours

Needfordatavisualization, Visualization packages, Data visualization standard

tools:Barplot,Plottingcategoricaldata,Stackedbarplot,Histogram,plot()function and line plot, pie chart / 3D pie chart, Scatterplot,Box plot; AdvanceddatavisualizationTypes:HeatMap,MosaicMap, Map Visualization, 3D Graphs, Correlogram, Q-Qplots, Visualization of Geospatial Data, Mapping Component: xandy-variable,

ScaleComponent:linearscale,logscale;EmbellishingComponent - axes labels, titles, legends, font size, Color,IntroductiontoDatavisualizationlibrariesincludingPython'sMatplotlibandSeabornPackagesandR's

ggplot2package.

**Total Lecture Hours** | 30 hours

Textbook:

S.No Book Title Author

1) Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley

Publishers, 2007.

- 2) Data Analysis and Data Mining, 2nd Edition, John Wiley & Sons Publication, 2014.
- 3) The Data Science Handbook, Field Cady, John Wiley & Sons, Inc, 2017

#### **Reference Books:**

- 1) A Hands-On Introduction to Data Science, Chirag Shah, University of Washington Cambridge University Press.
- 2) The Data Science Handbook, Field Cady, John Wiley & Sons, Inc, 2017
- 3) Data Mining Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann, 2012.
- 4) Open Data for Sustainable Community: Glocalized Sustainable Development Goals, Neha Sharma, Santanu Ghosh, MonodeepSaha, Springer, 2021.

S.No	Book Title	Author						
NPTEL/	Youtube/ Faculty Video Link:							
Unit 1	https://www.youtube.com/watch?v=KxryzSO1Fjs							
Unit 2	https://www.springboard.com/blog/data - wrangling/							
Unit 3	https://towardsdatascience.com/exploratory - data - analysis - fe031add7072	https://towardsdatascience.com/exploratory - data - analysis - in - r - for - beginners - fe031add7072						
Unit 4	https://learn.datacamp.com/courses/exploratory - data - analystech.github.io/stats for soil survey/chapters/4 exploratory a https://www.youtube.com/watch?v=32o0DnuRjfg							

Iode of Eval	luation							
		ESE	Total					
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendanc e 5	ESE	
30 20							50	100



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

Course Code: BCSAI0304	Course Name: High Performance Computing	L	T	P	C			
Course Offered in: CSE(DS), CSE(AI), CSE(AIML), CS								
D !!! CIT								

Pre-requisite: C Language

**Course Objectives:** This course introduces the fundamentals of High Performance Computing (HPC) and modern computing paradigms like cloud, grid, cluster, and quantum computing. It covers computing architectures, parallelism concepts, distributed memory models, and message-passing techniques. Students will also develop parallel applications using OpenMP and explore fault-tolerant mechanisms in cluster systems.

Course	e Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level (KL)
CO1	Identify the need, applications of HPC and emerging paradigms.	K2
CO2	Analyze architectures and parallelism for HPC performance.	K4
CO3	Apply message passing for parallel algorithm design.	K3
CO4	Analyze fault tolerance in cluster computing.	K4
CO5	Implement shared memory programs using OpenMP.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1		PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	1	-	2	1	2	3	3
CO2	3	3	2	2	3	-	1	-	1	1	1	3	3	3
CO3	3	3	3	2	3	-	-	-	2	1	1	3	3	3
CO4	2	3	2	2	2	-	-	1	2	1	1	3	3	3
CO5	2	2	3	2	3	-	-	_	1	1	1	3	3	3

#### Course Contents / Syllabus

#### Module 1 Introduction to HPC 10 hours

Computational Thinking, Computing, Why High-Performance Computing, Applications of High-Performance Computing, Parallel programming Software Platforms and its significance, Cloud computing, Grid computing, Cluster computing and Quantum Computing, Multi-core CPUs, Graphical Processing Units.

### Module 2 Computing Architectures 10 hours

SISD, SIMD, MISD, MIMD, Memory Hierarchy, Data parallelism, Task parallelism, Bit-level parallelism, Instruction-level parallelism, Concurrency, Decomposition, Mapping, PRAM, NUMA, Multithreading vs Multiprocessing, shared memory model, Open MP, distributed memory model, Message passing interface. Performance measures: Speedup, efficiency and scalability.

### Module 3 Distributed Memory 10 hours

Distributed memory and Message passing networks, Broadcast, Reduction, Parallel Prefix Sum, Scatter, Gather, Network topologies for parallel computing, Network optimization. Distributed BFS, Graphs and adjacency matrix, Matrix based BFS, CUDA programming, Parallel matrix operations, Sparse vs Dense matrices.

## Module 4 Cluster Computing 9 hours

BLAS, LAPAC, Cluster Computing, Clustering Models, Clustering Architectures, Clustering Architectures key factors, types of clusters, Mission critical Vs Business Critical Applications, Fault Detection and Masking Algorithms, Check pointing, Heartbeats, Watchdog Timers, Fault recovery through Failover and Failback Concepts.

Module 5		OpenMI	•					9 hours		
OpenMP, I	Key concepts, F	ork-join mo	del, Goals o	of OpenN	IP, Sup	ported platforms	and compil	ers, OpenMP AP		
component	ts: directives, r	untime rout	ines, envir	onment	variable	s, General code	e structure,	Core syntax and		
								nanaging threads		
		hreads, Thr	ead manage	ment and	d thread	IDs, Application	ns of OpenN			
	ure Hours							48 hours		
Textbook:	•									
S.No	Book Title					Author				
1	The Sourceboo	k of Paralle	l Computing	g		Jack Dongarra Kennedy	a, Geoffrey	Fox, and Ken		
2	Petascale Com	puting: Algo	orithms and	Applicat	tions	David A. Bade	r (Ed.)			
3	Parallel and Hi	gh Performa	ance Compu	ıting		Robert Robey a	and Yuliana	Zamora		
4	High Performa	ınce Compi	iting: Mode	ern Syste	ems and	Thomas Sterli	ng, Maciej	Brodowicz, and		
	Practices	1	· ·	•		Matthew Ande	rson			
Reference	Books:									
S.No	Book Title			Author						
1	High Performa	ınce Compi	Thomas Sterli	ng, Matthey	w Anderson, and					
	Practices Maciej Brodowicz									
2		P: Portable	e Shared M	Memory	Paralle	_	nan, Gabriel	le Jost, and Ruu		
	Programming		van der Pas							
3	Introduction to	Parallel Co	mputing			Ananth Gram Karypis, and V		Gupta, Georg		
4	The OpenMP (	Common Co	re: A Hand	s-on Exp	loration	Tim Mattson et	t al.			
5	A Hands-on In	troduction to	OpenMP			Tim Mattson and Larry Meadows				
6	OpenMP Taski	ng Explaine	ed			Ruud van der Pas				
7	An Introduction	n to Parallel	Programmi	ing		Peter Pacheco				
NPTEL/ Y	outube/ Facult	y Video Li	nk:			*				
Unit 1	https://yout	u.be/tGIobc	yKViI?si=e	6QKYtz	8z1KH0	G5GI				
Unit 2		v.youtube.co		_		<u> </u>				
Unit 3	https://wwv					ζ				
Unit 4		u.be/7rooW								
Unit 5		u.be/gcadM		_						
Mode of E	*					<u>&amp;</u>				
CIE							ESE	Total		
ST1	ST2	ST3	TA1	TA2	TA3	Attendance	1			
			5	5	5	5				
	30				20		100 150			



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

LAB Course Code: BCSE0353	LAB Course Name: Operating Systems Lab	L	T	P	С
Course Offered in: CSE/CSE-R/IT/C	0	0	4	2	

**Pre-requisite:** Basic knowledge of computer fundamentals, C programming, Data structure and Computer organization.

**Course Objectives:** The course aims to provide hands-on experience with Linux and shell programming, while the lab focuses on implementing and analyzing key OS algorithms and simulating modern operating systems.

**Course Outcome:** After completion of the course, the student will be able to

0 0 6	e duced in the completion of the course, the student will be use to	
		Bloom's
		Knowledge Level
		(KL)
CO1	Execute basic Linux commands and shell scripts to automate file management and system administration tasks.	К3
CO2	Implement and compare various CPU scheduling algorithms, process synchronization solutions using semaphores and deadlock handling algorithms.	K4
CO3	Simulate memory allocation techniques and page replacement algorithms, disk management strategies and explore modern OS features including virtualization and distributed computing.	

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

0010112	11 0	, \												
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	3	-	-	2	2	-	3	2	-	1
CO2	3	3	3	2	2	-	-	2	2	-	2	1	-	1
CO3	3	2	3	2	3	-	-	2	2	-	3	1	-	-

#### **List of Practical's (Indicative & Not Limited To)**

1	Imple	ementation of Linux Commands
	i.	Introduction of Unix/Linux Operating system and their architecture
	ii.	Display system information using uname, hostname, and date etc.
	iii.	File operations using cat, touch, cp, mv, rm, and chmod ,umask etc.
	iv.	Create, view, and navigate directories using mkdir, rmdir, cd, pwd, ls etc.
	v.	Disk Commands df,du,mount,unmount,mkfs,fsck etc.
	vi.	Use redirection and piping in commands
	vii.	File compression and archiving using tar, gzip, zip, unzip etc.
	viii.	Process commands ps,kill, killall,nice, pgrep, top,htop etc.
	ix.	Network commands ifconfig, ping, netstat, host,ip route etc.
	х.	Administrator Commands Adduser, Passwd, deluser, usermod, groupaddetc
	xi.	Implement different types of system calls in Unix/Linux.
2	Shell	Scripting Programming

	i. Write a shell script to ask your name, program name and enrollment number and print it on the
	screen.  ii. Write a shell script to find the sum, the average and the product of the four integers entered.
	iii. write a shell script to find the sun, the average and the product of the four integers entered.
	iv. Write a shell program to exchange the values of two variables
	v. Write a shell program to Print Numbers 1 to 10 using while & do while loop.
	vi. Write a shell program to Print Numbers 1 to 10 using for loop.
	vii. Write a shell script to display the digits which are in odd position in a given 5-digit number.
	viii. Write a shell program to search for a given number from the list of numbers provided using binary search method.
	ix. Write a shell program to concatenate two strings and find the length of the resultant string
	x. Write a shell script to find the smallest of three numbers
	xi. Write a shell program to count number of words, characters, white spaces and special symbols in
	a given text
2	Process & Thread Management  Introduction to C. Programming (Statement, Conditional Statement, Lean, Array, & Function)
3	Introduction to C Programming (Statement, Conditional Statement, Loop, Array & Function)
4	Implement FCFS CPU Scheduling algorithm.
5	Implement the SJF CPU Scheduling algorithm (For both Pre-emptive and Non-pre-emptive).
6	Implement PRIORITY CPU Scheduling Algorithm (For both Pre-emptive and Non-pre-emptive).
7	Implement Round-Robin CPU Scheduling Algorithm.
8	Implement Multi-Level Queue CPU Scheduling algorithm.
9	Implement Multilevel Feedback Queue CPU Scheduling Algorithm.
	Concurrency and Deadlock Management
10	Execute the RACE Condition of Process Synchronization.
11	Implement the Producer–consumer problem using semaphores.
12	Design a code and implement the Dinning Philosopher problem.
13	Implement Banker's algorithm of Deadlock Avoidance.
14	Execute an algorithm for Deadlock Detection.
	Memory Management
15	Implement the Memory Fixed-size partition scheme.
16	Implement the Memory Variable-size partition scheme.
17	Simulate the First-Fit contiguous memory allocation technique.
18	Simulate the Best-Fit contiguous memory allocation technique.
19	Simulate the Worst-Fit contiguous memory allocation technique.
20	Implement the Non-contiguous Memory Allocation by using Paging.
	Page Replacement
21	Write a Program to simulate the FIFO page replacement algorithm.
22	Write a Program to simulate the LRU page replacement Algorithm.
23	Write a Program to simulate the Optimal page replacement Algorithm.
	Disk Scheduling
24	Write a program to simulate FCFS Disk Scheduling Algorithm.
25	Write a Program to simulate the SSTF Disk Scheduling Algorithm.
26	Write a program to simulate SCAN Disk Scheduling Algorithm.
27	Write a Program to simulate the C SCAN Disk Scheduling Algorithm.
28	Write a Program to simulate the LOOK Disk Scheduling Algorithm.

29	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
	Modern Operating System
30	Introduction of CUDA Programming.
31	Write a program in CUDA print message "Welcome CUDA programming"
32	Implement matrix multiplication using shared memory in CUDA.
33	Connects to VMware vCenter and lists all virtual machines along with their power state.
34	Create a new virtual machine in Azure with specified configurations.
35	Deploy a simple HTTP-triggered distributed Azure Function.
	Total Hours: 48 hrs.

#### Mode of Evaluation

	PE	Total		
PS1	PS2	PS3	(If mentioned	
10	20	20	in curriculum)	
	50		50	100



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science & Information Technology** 

LAB Course Code: BCSE0351	LAB Course Name: Data Structures and Algorithms- I Lab	L	T	P	C
Course Offered in: CSE/CS/C /IT/CSE(AI)/CSE(AIML)/CS		0	0	4	2
/II/Coe(AI)/Coe(AIME)/Co	E(DS)/CSE(CS)				

**Pre-requisite:** The concept of Programming Language

#### **Course Objective:**

The objective of the course is to compare the time complexities of various algorithm and implementation of linear data structure.

**Course Outcome:** After completion of the course, the student will be able to:

		Bloom's KnowledgeLevel (KL)
CO1	Implement array and matrix operations along with searching and sorting algorithms to solve computational problems.	K3
CO2	Implement Link list, Stack and Queues with their applications.	K3
CO3	Implement divide and conquer and greedy algorithms to solve problems like sorting, scheduling and optimization.	К3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1				PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	1	1	1	1	1	2	3	1	1
CO2	3	3	3	2	3	1	1	1	1	1	2	3	1	1
CO3	3	3	3	3	3	1	1	1	1	1	3	3	1	1

#### **List of Practical (Indicative & Not Limited To)**

- 1. Construct a program to compare the time complexities of selection, bubble and insertion sort by plotting the graph.
- 2. Construct a program to compare the time complexities of various algorithms by varying size "n".
- 3. Construct a program to find the maximum element in an array.
- 4. Construct a program to calculate the sum of all elements in an array.
- 5. Construct a program to reverse the elements of an array.
- **6.** Construct a program to check if an array is sorted in ascending order.
- 7. Construct a program to count the occurrence of a specific element in an array.
- 8. Construct a program for creation and traversal of 2D Array in row major and column major order.
- 9. Construct a program to print the transpose of a given matrix using function.

10. Construct a program to find if a given matrix is Sparse or Not and print Sparse Matrix. 11. Construct a program to represent a sparse matrix in triplet form. 12. Construct a program to implement Linear Search. 13. Construct a program to implement Binary Search. 14. Construct a program to implement Selection Sort. 15. Construct a program to implement Bubble Sort. 16. Construct a program to implement Insertion Sort. 17. Construct a program to implement Shell Sort. 18. Construct a program to implement Counting Sort. 19. Construct a program to create a single linked list and perform basic operations (insertion, deletion, traversal). 20. Construct a program to create a double linked list and perform basic operations (insertion, deletion, traversal). 21. Construct a program to create a circular linked list and perform basic operations (insertion, deletion, traversal). 22. Construct a program to create a circular double linked list and perform basic operations (insertion, deletion, traversal). 23. Construct a program to reverse a single linked list. 24. Construct a program to check if a linked list is palindrome. 25. Construct a program to reverse a double linked list. 26. Construct a program to find the middle element of a single linked list. 27. Construct a program to find the middle element of a double linked list. 28. Construct a program to merge two sorted single linked lists. 29. Construct a program to detect and remove a loop in a circular linked list. 30. Construct a program to add two polynomials using linked list. 31. Construct a program to implement stack using array. 32. Construct a program to implement stack using a linked list. 33. Construct a program to infix to postfix conversion using a stack. 34. Construct a program for balanced parentheses checker using a stack. 35. Construct a program to reverse a string using a stack. 36. Construct a program to implement Binary search using recursion. 37. Construct a program to print Fibonacci series using recursion. 38. Construct a program to implement Tower of Hanoi. 39. Construct a program to implement queue using array. 40. Construct a program for implementing a circular queue. 41. Construct a program to implement queue using stack. 42. Construct a program to implement priority queue. 43. Construct a program to implement double ended queue.

44. Construct a program to implement Me	44. Construct a program to implement Merge Sort with recursion.									
45. Construct a program to implement Quick Sort with recursion.										
46. Construct a program to implement Merge Sort using iteration.										
47. Construct a program to implement Qui	47. Construct a program to implement Quick Sort using iteration.									
48. Construct a program to implement frac	48. Construct a program to implement fractional knapsack.									
49. Construct a program to implement Act	tivity selection problem.									
50. Construct a program to implement Job	scheduling problem.									
	Total Hours	48 Hours								
M	lode of Evaluation									
CIE	PE Total									
PS	PS (If mentioned in curriculum)									
50	50		100							



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

LAB Course Code: BCSDS0351	LAB Course Name: Foundations of Data Science Lab	L	T	P	С
<b>Course Offered in: Data Science</b>		0	0	2	1

**Pre-requisite: C, Python** 

Course Objectives: This course aims to equip students with hands-on experience in data analysis,

machine learning, and data visualization using contemporary tools and techniques.

Course	e Outcome: After completion of the course, the student will be able to	Bloom's		
		Knowledge		
		Level (KL)		
CO1	Understand different types of data and file formats.	K2		
CO2	Execute exploratory data analysis on different data types using R programming Language.	K3		
CO3	Illustrate Data Mining and Warehousing so students can learn to clean and analyze the stored data.	K4		

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	1	1	1	-	1	2	3	3	-
CO2	2	2	1	1	2	1	1	2	-	2	2	3	3	-
CO3	2	2	2	1	2	1	1	1	-	2	1	3	3	-

#### **List Of Practicals (Indicative & Not Limited To)**

- 1. Write a R program to create a list containing strings, numbers, vectors and a logical values.
- 2. Write an R program to create a Data frame which contains details of 5 employees and display the details.
- 3. Write a R program to get the first 10 Fibonacci numbers.
- 4. Write a R Program to Sample data from a Population.
- 5. Write an R program to get all prime numbers up to a given number.
- 6. Find Sum, Mean and Product of Vector in R Programming.
- 7. R Program to Generate Random Number from Standard Distributions.
- 8. Write an R program to find the maximum and the minimum value of a given vector.
- 9. R Program to Count the Number of Elements in a Vector.
- 10. Create an array, passing in a vector of values and a vector of dimensions, also provide names for each dimension.
- 11. Write an R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.
- 12. Write an R program to create a list containing a vector, a matrix and a list and add element at the end of the list.
- 13. Read the following file formats in Python/R:
  - Comma-separated values
  - XLSX

- ZIP
- Plain Text (txt)
- JSON
- XML
- HTML
- Images
- Hierarchical Data Format
- PDF
- DOCX MP3
- 14. Load the Iris dataset as a list of lists.

Compute and print the mean and the standard deviation for each of the 4 measurement columns (i.e., sepal length and width, petal length and width).

Compute and print the mean and the standard deviation for each of the 4 measurement columns, separately for each of the three Iris species.

- 15. a. Find the data distributions using box and scatter plot.
- b. Find the outliers using box plot.
- c. Plot the histogram, bar chart and pie chart on sample data
- d. Plot Pie Chart, Histogram (3D) [including colorful ones]
- 16. Import a sample dataset and perform Regression techniques to find out relation between variables.
- 17. Find the correlation matrix. a. Plot the correlation plot on dataset and visualize giving an overview of relationships among variables on data set. b.Analysis of covariance: variance (ANOVA)if data have categorical variables on data set.
- 18. Write a program to create 3D plot, to add title, change viewing direction, add color and shade to the plot.
- 19. a. Create a data frame from the sample data set.
- b. Create a table with the needed variables.
- c. Perform the Chi-Square test.
- 20. Perform complete steps of Data Cleaning process on standard data sets e.g( Housing Dataset, Automobile Dataset etc.) and visualize the Information Gains using R.

Total Hours: 48 hrs.

Mode of Evaluation				
	CIE		PE	Total
PS1	PS2	PS3	(If	
10	20	20	mentioned in	
			curriculum)	
	50		50	100



#### **GREATER NOIDA-201306**

(An Autonomous Institute)
School of Computer Science in Emerging Technologies

Course Code: BCSE0352	Course Name: Object Oriented	L	T	P	С
	Techniques using Java				
Course Offered in:		0	0	6	3
CSE/CS/IT/CSE(AI)/CSE(AIML)/CSE(I	OT)/CSE(AI)/CSE(DS)/CSE-R/M.Tech int				

#### **Pre-requisite:**

- 1. Basic Programming Knowledge
- 2. Knowledge of any programming language (e.g., C, C++, Python)

#### **Course Objectives:**

The objective of this course is to understand the object-oriented methodology, and its techniques to design stand alone and GUI applications using hands-on engaging activities.

Course Outcome: After completion of the course, the student will be able to

S.No	Course Outcome	Bloom's
		Level
CO1	Understand the concepts of object-oriented programming and relationships among them needed in modeling.	K2
CO2	Demonstrate the Java programs using OOP principles and also implement the concepts of lambda expressions.	K3
CO3	Analyze packages with different protection level resolving namespace collision and implement the error handling concepts for uninterrupted execution of Java program.	K4
CO4	Implement Concurrency control, I/O Streams and Java Socket Programming Concepts.	K3
CO5	Design and develop the GUI based application, Generics and Collections in Java programming language to solve the real-world problem.	K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

	10 Mapping (Scale 1, 2011) 24 Medium, et 11gh)													
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	-	1	-	2	3	2	2
CO2	3	3	3	3	2	2	1	-	1	1	2	3	2	2
CO3	3	3	3	3	3	2	2	-	2	1	2	3	3	2
CO4	3	3	3	3	3	2	2	1	2	1	2	3	2	2
CO5	3	3	3	3	3	2	2	1	2	1	2	3	3	3

**Course Contents / Syllabus** 

Unit 1 Basicsof Java Programming 16 hours

**Object Oriented Programming:** Introduction and Pillars of OOP with real life example, jvm architecture and its components

**Modelling Concepts:** Introduction, Class Diagram and Object Diagram, UML concepts: Association, Composition, aggregation, realization, and Generalization.

**Control Statements:** Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument, Console Input.

**ClassandObject:** ObjectReference, Constructor, Abstraction: AbstractClass, Interfaceanditsuses, DefiningMethods, Useof "super" keyword, Garbage Collection and finalize() Method etc.

Unit 2

OOPs features, arrays and lambda expressions

16 hours

**Inheritance:** Introduction and Types of Inheritance in Java, Access Modifiers, Constructors and super constructor in Inheritance.

**Polymorphism:** Introduction and Types, Overloading and Overriding.

**Lambdaexpression:** Introduction and Working with Lambda Variables.

**Arrays:** Introduction and ts Types. Jagged Array with example

Unit 3

Packages, Exception Handling and String Handling

16 hours

Packages: Introduction and Types, Access Protection in Packages, Import and Execution of Packages.

Exception Handling, Assertions and Localizations: Introduction and Types, Exceptions vs. Errors, Handling of Exception. Finally, Throws and Throw keyword, Multiple Catch Block, Nested Try and Finally Block, Customized Exceptions, Tokenizer. Assertions and Localizations Concepts and its working.

**String Handling:** Introduction and Types, Operations, Immutable String, Method of String class, String Buffer and String Builder class.

Unit 4

#### ConcurrencyinJavaandI/OStream

16 hours

**Threads:** Introduction and Types, Creating Threads, Thread Life-Cycle, Thread Priorities, Daemon Thread,RunnableClass, SynchronizingThreads etc.

**I/OStream:** IntroductionandTypes,Common I/OStreamOperations, Interactionwith I/OStreamsClasses. character and byte oriented stream classes with example

**Java Socket Programming**: Introduction and types(TCP, UDP), java socket program with server-side and client-side by using connection.

Unit 5

#### ${\bf GUIP rogramming,} {\bf Generics and Collections}$

16 hours

**GUIProgramming:** Introduction and Types, Swing, AWT, Components and Containers, Layout Managers and User-Defined Layout and Event Handling.

**Generics:** Introduction to Generic Classes, types of generic defined in brief, bounded type parameter(Upper and Lower bound), Initializing a Generic Object, Classes, Methods and Interfaces Use enumerated type.

**Collections:** Introduction, main interfaces of collections(Collection, List Set, Map, Queue), classes of collections(ArrayList,Linked list, HashSet, HashMap and TreeSet) and methods(List, Set Map) Collection using Iterators

Total Lecture Hours | 80 hours

#### **Textbook:**

- 1.Herbert Schildt," Java: A Beginner's Guide", McGraw-Hill Education 2nd edition
- 2.E Balagurusamy, "Programming with Java A Primer", TMH, 4th edition.

#### **Reference Books:**

- 1. Cay S. Horstmann, "Core Java Volume I Fundamentals", Prentice Hall
- 2. Joshua Bloch," Effective Java", Addison Wesley
- 3. Herbert Schildt," Java The Complete Reference", McGraw Hill Education 12th edition

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=r59xYe3Vyks&list=PLS1QulWo1RIb fTjQvTdj8Y6yyq4R7g-Al
Unit 2	https://www.youtube.com/watch?v=ZHLdVRXIuC8&list=PLS1QulWo1 RIbfTjQvTdj8Y6yyq4R7g-Al&index=18
Unit 3	https://www.youtube.com/watch?v=hBh_CC5y8-s
Unit 4	https://www.youtube.com/watch?v=qQVqfvs3p48
Unit 5	https://www.youtube.com/watch?v=2qWPpgALJyw

#### **Mode of Evaluation**

		ESE						
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
		2	20	100				

#### **List Of Practical's (Indicative & Not Limited To)**

- 1. Understanding Text Editors to Write Programs Compile and run first java file Byte Code and class file
- 2. Sketch a class and object diagram describing the sales order system of restaurant
- 3. Sketch a class diagram describing the circle and rectangle class
- 4. Sketch a class diagram for a college platform including, classroom, playground, chair, table, smart board, teaching staff etc.
- 5. Sketch a class diagram containing class called Employee, which models an employee with an ID, name and salary. Add method raiseSalary(percent) that increases the salary by the given percentage.
- 6.Program to display default value of all Primitive data types
- 7. Implement the code using main() method to calculate and print the Total and Average marks scored by a student from the input given through the command line arguments.

Assume that four command line arguments name, marks1, marks2, marks3 will be passed to the main()

method in the below class with name TotalAndAvgMarks.

- 8. Write code which uses if-then-else statement to check if a given account balance is greater or lesser than the minimum balance. Write a class BalanceCheck with public method checkBalance that takes one parameter balance of type double. Use if-then-else statement and print Balance is low if balance is less than 1000. Otherwise, print Sufficient balance.
- 9. A class NumberPalindrome with a public method isNumberPalindrome that takes one parameter number of type int. Write a code to check whether the given number is palindrome or not.

For exampleCmdArgs: 333

333 is a palindrome

- 10. Write a class Fibonacci Series with a main method. The method receives one command line argument. Write a program to display fibonacci series i.e. 0 1 1 2 3 5 8 13 21
- 11. Write a Java Program to find the Factorial of a given number.
- 12. Java Program to create a class, methods and invoke them inside main method.
- 13. Write a Java program to illustrate the abstract class concept. Create an abstract class Shape, which contains an empty method numberOfSides().

Define three classes named Trapezoid, Triangle and Hexagon extends the class Shape, such that each one of the classes contains only the method numberOfSides(), that contains the number of sides in the given geometrical figure. Write a class AbstractExample with the main() method, declare an object to the class Shape, create instances of each class and call numberOfSides() methods of

#### each class.

- 14. Java program to illustrate the static field in the class.
- 15. Java Program to illustrate static class.
- 16. Write a java program to access the class members using super keyword
- 17. Java program to access the class members using this keyword
- 18. Implement an interface named MountainParts that has a constant named TERRAIN that will store the String value "off\_road". The interface will define two methods that accept a String argument name newValue and two that will return the current value of an instance field. The methods are to be named: getSuspension,

setSuspension, getType, setType.

- 19. Java program to demonstrate nested interface inside a interface.
- 20.Java program to demonstrate nested interface inside a class.
- 21. Java program to explicit implementation of garbage collection by using finalize() method
- 22. Java program to implement Single Inheritance
- 23. Java program to implement multi-level Inheritance
- 24. Java program to implement constructor and constructor overloading.
- 25.Java program implement method overloading.
- 26.Java program to implement method overriding.
- 27. Java program to implement lambda expression without parameter.
- 28.Java program to implement lambda expression with single parameter.
- 29. Java program to implement lambda expression with multi parameter.
- 30. Java program to implement lambda expression that iterate list of objects
- 31. Java program to define lambda expressions as method parameters
- 32.Write a class CountOfTwoNumbers with a public method compareCountOf that takes three parameters one is arr of type int[] and other two are arg1 and arg2 are of type int and returns true if count of arg1 is greater than arg2 in arr. The return type of compareCountOf should be boolean.

#### Assummptions:

• arr is never null

<ul> <li>arg1 and arg2 may be same</li> </ul>
33.Java program to show the multiplication of two matrices using arrays.
34. Java Program to search an element using Linear Search
35.Java program to search an element using Binary Search
36.Java Program to sort element using Insertion Sort
37.Java Program to sort element using Selection Sort– Largest element Method
38.Java program to Sort elements using Bubble Sort
39.Java program to create user defined package.
40.Java Program to create a sub- classing of package
41.Implement the following:
1. Import package.*;
2. import package.classname;
51. Using fully qualified name.
42.Implement and demonstrate packagenames collision in java
43. Java program to handle and Arithmetic Exception Divided by zero
44.Java Program to implement User Defined Exception in Java
45.Java program to illustrate finally block
46.Java program to illustrate Multiple catch blocks
47.Java program for creation of illustrating throw in exception handling.
48.Implement the concept of Assertion in Java Programming Language
49.Implement the concept of Localization in Java Programming Language.
50.Java program to print the output by appending all the capital letters in the input string.
51.Java program that prints the duplicate characters from the string with its count.
52. Java program to check if two strings are anagrams of each other
53. Java Program to count the total number of characters in a string
54. Java Program to count the total number of punctuation characters exists in a String
55.Java Program to count the total number of vowels and consonants in a string
56.Java Program to show .equals method and == in java
57. Given a string, return a new string made of n copies of the first 2 chars of the original string where n is the length of
the string. The string may be any length. If there are fewer than 2 chars, use whatever is there. If input is "Wipped"
then output should be "WiWiWiWi".

58. Given two strings, a and b, create a bigger string made of the first char of a, the first char of b, the second char of a
the second char of b, and so on. Any leftover chars go at the end of the result. If the inputs are "Hello" and "World",
then the output is "HWeolrllod".
59.Java program to show the usage of string builder.
60.Java program to show the usage of string buffer.
61.Creating and Running a Thread
62.Implementing Runnable Interface
63.Synchronizing Threads with lock
64.Synchronizing Threads without lock
65. Java program to implement even and odd threads by using Thread class .
66. Java program to implement even and odd threads by using Runnable interface.
67. Java program to synchronize the threads by using Synchronize statements and Synchronize block.
68. Write a program where the client sends a message to the server, and the server prints it by using TCP
69.Implement a server that can handle multiple clients simultaneously using UDP
70. Write a client-server application where the client uploads a file and the server saves it by using TCP/UDP.
71. Java program to implement that read a character stream from input file and print it into output file.
72.Java program to implement that merge the content of two files (file1.txt, file2.txt) into file3.txt.
73. Write a Java program that reads the contents of one file and copies them to another file.
74. Write a Java program that reads a text file and counts the number of words in it.
75. Write a Java program that reads a text file and counts the frequency of each word in it.
76. Write a Java program that reads a text file and adds line numbers to each line. The program should create a new file with the line numbers added to the beginning of each line.
77. Write a Java program that reads two binary files and compares them byte by byte to determine if they are identical. Display a message indicating whether the files are the same or different.
78.Program to create a frame with three button in AWT and swing
79.Program to display message with radio buttons in swing
80.Program to display "All The Best" in 5 different colors on screen. (Using AWT/Swing)
81.Program to implement handling in a button "OK"
82.Java Program to implement BorderLayout

83.Java Program to implement GridLayout
84. Java Program to implement BoxLayout
85. Java Program to implement CardLayout
86. Java program to implement Generic class
87. Java program to illustrate Generic methods
88.Java program to implement wildcard in generics
89.Java program to implement of methods of HashSet
90.Java Program to implement methods available in HashMap class
91.Program to add, retrieve, and remove element from ArrayList
92.Create a method which can accept a collection of country names and add it to ArrayList with
generic defined as String and return the List.
93.Create a method which can create a HashSet containing values 1-10.The Set should be declared with the generic
type Integer. The method should return the Set.
94. Java program to implement autoboxing
95.Java program to implement unboxing
96.Develop a java class with a method storeEvenNumbers(int N) using ArrayList to store even numbers from 2 to N, where N is a integer which is passed as a parameter to the method storeEvenNumbers(). The method
should return the ArrayList (A1) created.
97.Create a method that accepts the names of five countries and loads them to an array list and returns the list.
98.Create a method which can accept a collection of country names and add it to ArrayList with generic defined as String and return the List.



#### **BGREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

	School of Computer Science in E			ologics	
Course Code:	Course Name: Environmental Science	L	T	P	C
BNC0302Y					
Course Offered in: All th	e branches	2	0	0	-
<b>Pre-requisite:</b> Basic known	wledge of biology, chemistry, ecology, geology, ma	thema	tics, and t	ındersta	nding
of human impacts on natu	ral systems.				
Course Outcome- After	completion of the course, the student will be able to	)		Bloom	's
			Kno	owledge	Level
				(KL)	
	Understand the basic principles of ecology and		K1,1	K2	
CO1	environment. Ecosystem: Basic concepts, compor		f		
	ecosystem, food chains and food webs. Ecological pyramids, biodiversity.	l			
	Understand the different types of natural recourse	c like	K1,1	K2	
CO2	food, forest, Minerals and energy and their conser			IXZ	
CO2	Understand the different types of pollution, pollut			K2	
CO3	sources, effects and their control methods.	,	,		
	Understand the basic concepts of sustainable deve			K2	
CO4	Environmental Impact Assessment (EIA) and diff	erent a	.cts		

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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	3	3	2	2	-	2	2	2	1
CO2	3	3	2	2	-	3	3	2	2	-	2	2	2	1
CO3	3	3	2	2	-	3	3	2	2	-	2	3	3	2
CO4	3	3	2	2	-	3	3	3	2	-	2	2	3	3

**Course Contents / Syllabus** 

Module 1	Basic Principle of Ecology and Biodiversity	4 hours
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related to environment

Definition, Scope and basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem. Food chains and food. Webs. Ecological pyramids, Energy flow in ecological systems, Characteristics of different ecosystems. Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Biodiversity and their importance, Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book. Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies Mega diversity zones and Hot spots, concepts, distribution and importance.

Module 2	Natural Resources and Ecological succession	4 hours
Natural resources and ass	ociated problems. Forest resources: Use and over-	exploitation, deforestation.
Timber extraction mining	a dame and their effects on forest and tribal neonle	Mineral resources: Use and

exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over- grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, and salinity. Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles.

Non-Renewable Energy Resources: Fossil fuels and their reserves, Nuclear energy, types, uses and effects, Renewable Energy Resources: hydropower, Solar energy, geothermal, tidal and wind energy, Biomass energy, biogas and its advantages. Ecological succession-Types, stages, examples of ecological succession

#### Module 3 Pollution and Waste Management 4 hours

Air pollution: sources of air pollution, Primary and secondary air pollutants. Origin and effects of SOX, NOX, Cox,CFC, Hydrocarbon, control of air pollution. Water pollution: sources and types of water pollution, Effects of water pollution, Eutrophication, Soil pollution: Causes of soil pollution, Effects of soil pollution, Major sources of and effects of noise pollution on health, Radioactive and thermal pollution sources and their effects on surroundingenvironment. Solidwastedisposal and itseffects on surrounding environment, Introduction to E- Waste, Types and classification of E- Waste, Impacts of E- Waste on environment and human health, E-Waste management and recycling., Climate change, global warming, acid rain, ozone layer depletion.

Module 4 Environmental Assessment and Legislation 4 hours

Women education, Role of NGOs regarding environmental protection, Bio indicators and their role, Natural disasters and disasters management, Aims and objectives of Environmental Impact Assessment (EIA). Salient features of following Acts: Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972. Water (Prevention and control of pollution) Act, 1974. Forest (Conserving) Act, 1980. Definition and concept of sustainability, impacted areas of sustainable development, Global initiative and issues on sustainable development UNSDsGs, System Thinking and Sustainability.

	Total Lecture Hours 20 hours
Textbook:	
S.No	Book Title
1	Brady, N.C. 1990. Thenature and properties of Soils, Tenth
	Edition.MacMillanPublishingCo.,New York
2	Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing
	House, New Delhi.
3	Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.
G N	72 1 FF14
S.No	Book Title
1	RaoM.N.andH.V.N.Rao,1989:AirPollution,TataMcGrawHillPublishingCo.Ltd.,
•	NewDelhi
2	AText Book ofenvironmentalScienceByShashi Chawla
Unit 1:	https://www.youtube.com/watch?v=T21OO0sBBfc,
	https://www.youtube.com/watch?v=qt8AMjKKPDo
Unit 2:	https://www.youtube.com/watch?v=mOwyPENHhbc,
	https://www.youtube.com/watch?v=yqev1G2iy2

	https://www.youtube.com/watch?v=_74S3z3IO_I,
	https://www.youtube.com/watch?v=jXVw6M6m2
Unit 3:	https://www.youtube.com/watch?v=7qkaz8ChelI,
	https://www.youtube.com/watch?v=NuQE5fKmfME
	https://www.youtube.com/watch?v=9CpAjOVLHII,
	ttps://www.youtube.com/watch?v=yEci6iDkXYw
Unit 4	https://www.youtube.com/watch?v=ad9KhgGw5iA,
	https://www.youtube.com/watch?v=nW5g83NSH9 M,
	https://www.youtube.com/watch?v=xqSZL4Ka8xo
3.7 1 OT 1 4	

#### **Mode of Evaluation**

			ESE Tota					
ST1	ST2	ST3	TA1	TA2	TA3	Attendance		
			5	5	5	5		
	30			<u> </u>	20		50	100
			1					1



#### **BGREATER NOIDA-201306**

(An Autonomous Institute)

					\$	School	of Co	mpute	r Scie	nce in E	Emergin	g Te	chn	ologies	8
Course		Cours	se Nan	ne: Art	tificial	Intelli	igence	and C	yber I	Ethics		L	T	P	C
Code:															
BNC0301	1 <b>Y</b>														
Course C	Offered	l in:Al	l the b	ranches	S							2	0	0	-
Pre-requ	isite: I	Basic u	ndersta	anding	of AI,	Cyber	crime,	Comp	uter Sy	stem ar	nd Ethic	s.		•	
Course O	Outcon	ne- Aft	er com	pletion	of the	cours	e, the	student	will b	e able to	)			В	loom's
														Kn	owledge
														Le	vel (KL)
CO1								marizir ploym		cal cons	ideratio	ns an	d	K2	
CO2		Apply	polici	es and	frame	work f	or Fair	ness in	AI an	d Mach	ine Lear	ning.		К3	
CO3		11.	-	•		•		isk ma er Secu	_	ent and	regulato	ory		К3	
CO4			(IPR),			•		-			llectual d preve		•	K2	
CO-PO N	M <mark>appi</mark>	ng													
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSC	)1	PSO2	PSO3
CO1	-	1	-	-	-	1	2	-	-	-	2	1		1	-

CO/PO	POI	POZ	PO3	PO4	POS	PO6	PO7	PO8	PO9	POIU	POII	PSO1	PSO2	PSO3
CO1	-	1	-	-	-	1	2	-	-	-	2	1	1	-
CO2	2	3	2		2	1	2	-	2	1	2	2	1	2
CO3	2	3	2	1	2	3	3	-	2	2	2	2	2	2
CO4	2	2	-	-	1	3	3	-	2	2	2	2	1	2

#### **Course Contents / Syllabus**

An Overview to AI Ethics Module 1 6 hours

Definition of AI Ethical principles in AI, Sources of AI data, Legal implications of AI Security Breaches, Privacy and AI Regulations, Key Principles of Responsible AI, Transparency and Accountability, Dual-Use Dilemma, Human-Centric Design, Introduction to Cyber Laws and Ethics, Historical Development of Cyber laws, Legal frameworks.

#### **Fairness and Favoritism in Machine Learning** 8 hours Module 2

Introduction to Fairness and Bias in AI, Types of Fairness and Bias, Impact of Bias and Fairness in AI, Techniques for Measuring Fairness and Bias, Techniques for Mitigating Bias, Current Policies and Frameworks for Fairness in AI, Bias in Data Collection, Fairness in Data Processing, Generative AI, Types of Bias in Generative AI.

Module 3	AI Ethics and Cybersecurity Principles	8 hours
Importance of Priv	racy and Security in AI, AI specific Security Tools and Software, Privacy-Preserving	g Machine Learning
(PPML) and Priva	cy-Preserving Data Mining (PPDM), Risk Management: Risk Assessment and Incide	ent Response, Regulatory
Compliance: GDP	R, HIPAA, Case Studies: Implementation of AI Ethics guidelines and best practices	in engineering projects.
Module 4	Cybercrimes, IPR and Legal Measures	8 hours

Types of Cybercrimes and their Impact, Legal measures for Cybercrime Prevention and Prosecution, IPR: Copyrights, Trademarks, Patents, and Trade Secrets, Ethical Implications of Intellectual Property, Cyber Security and Privacy Issues, Cyber Crime Investigations and Digital Evidence Handling, Overview of Indian Cyber Laws (IT Act 2000 and Amendments), Comparative Overview: Indian vs Global Cyber Laws, Case Study: The ATM Heist - Cosmos Bank Cyber Attack (India, 2018).

2	Book Title  Artificial Intelligence: A Guide for Thinking Humans by Melanie Mitch  Cyber Ethics: Morality and Law in Cyberspace by Richard Spinello, Jor (2023).  ook  Book Title  Artificial Intelligence and Ethics by S. B. Kishor, Debajit Biswas, BPB	nes & Bartlett Learn	
2 Reference Books	Artificial Intelligence: A Guide for Thinking Humans by Melanie Mitch Cyber Ethics: Morality and Law in Cyberspace by Richard Spinello, Joe (2023).  Ook  Book Title	nes & Bartlett Learn	
2 Reference B	Cyber Ethics: Morality and Law in Cyberspace by Richard Spinello, Joe (2023).  ook  Book Title	nes & Bartlett Learn	
Reference B	(2023).  ook  Book Title		ing, 7th Editio
S.No	Book Title	Publications 2022	
_		Publications 2022	
1	Artificial Intelligence and Ethics by S. B. Kishor, Debajit Biswas, BPB	Publications 2022	
		i uoneauons, 2023.	
2	Cyber Security and Cyber Laws by Alfred Basta, Nadine Basta, Sattwik	R Panda, Cengage In	dia, 2022.
1.	https://www.youtube.com/watch?v=VqFqWIqOB1g		
2.	https://www.youtube.com/watch?v=hVJqHgqF59A		
3.	https://www.youtube.com/watch?v=O5RX_T4Tg24		
1.	https://www.youtube.com/watch?v=RJZ0pxcZsSQ		
Mode of Eva	aluation		
	CIE	ESE	Total
ST1	ST2 ST3 TA1 TA2 TA3 Attendance	-	

**Total Lecture Hours** 

30 hours



### **GREATER NOIDA-201306**

(An Autonomous Institute) School of Computer Science in Emerging Technologies

Course Code	: BAS	CC004	401				Empl	se Nan oyabil opmei	ity Sk		L	,	Т	P	C	
Course Offer	ed in:					N					2		0	0	2	
Pre-requisite	: Basic	unde	rstandi	ng of	elemei	ntary n	nathen	natics								
Course Obje	ctives:															
The objective	of this	s cour	se is to	deve	lop stu	udents'	quan	itative	aptitu	ide and	logical	reasoni	ng skills	throug	h num	
theory, analyt	ical pu	zzles,	and bu	siness	mathe	ematics	s, enab	ling th	em to	solve re	al-worl	d and co	ompetitiv	e exam	proble	
with speed, a	ccuracy	, and	logical	thinki	ing.											
Course Outc	ome: A	After c	omplet	ion of	the co	ourse, 1	the stu	dent w	ill be	able to			Bloom	's Knov	vledge	
													Level (	KL)		
CO1			div	isibilit	y, HC		CM, r	emaino	der the	orem, a	s such and cycl			K2, K3	3	
CO2			thin patt	king, erns, a	includ	ing di ne-base	rectioned puz	n sens zles lil	e, bloc se cloc	od relat		eries rs.	К3			
patterns, and time-based puzzles like clocks and calendars.  Solve real-life business math problems involving percentages, profit and loss, discounts, interest average calculations and using appropriate mathematical methods								K2, K3	K2, K3							
CO4 D-PO Mappir	og (Sca	le 1• I	mix	tures,	and ra	tios us	ing ap	•			g avera	_		K2, K3	3	
CO-PO Mapping								PO8	PO9	PO10	PO11	PSO1	PSO2	PS	503	
CO1	1	1	1	1	-	-	-	-	-	-	-	3	2		2	
CO2	1	1	1	1	-	-	-	-	-	-	-	2	2		3	
CO3	1	1	1	1	-	-	-	-	-	-	-	3	3		2	
CO4	1	1	1	1	-	-	-	-	-	-	-	2	2		2	
Course Cont	ents / S	Syllab	us										ı			
Module 1					S	peed 1	Math	and N	umbe	r Systei	n	8 ho	ours			
Classification digit, Remain				•	,		ŕ				pplication	on, Unit	t digit(Cy	clicity)	), Last t	
Module 2					A	nalyti	ical ar	ıd Log	gical R	easonii	ng	8 ho	ours			
Direction and	Sense,	, Blood	d Relat	ion, N												
					TD	) ai a	N/					101				
Module 3					D	busine	ss Ma	th I				8 ho	ours			

Iodule 4			Busine	ss Math	II		8 hours						
atio & Prop	ortion, Partn	ership, Mixtu	re & Allegat	ion, Cloc	k, Cale	ndar							
Refe	rence Books	•											
S.	No	Book Titl	le										
	1 M.Tyra(BSCpublicationco.Pvt.Ltd), Quickermath												
,	2 RSAggarwal , QuantitativeAptitude												
	3	RSAggary	val, Verbal&	Non-Ver	balReas	oning							
	4	SarveshK	Verma, Quai	ntitativeA	ptitude-	QuantumCAT							
NPTEL/ You	utube/ Facul	ty Video Lin	ık:										
Mode of Eva	aluation												
Mode of Eva	aluation		CIE				ESE	Total					
Mode of Eva	aluation ST2	ST3	CIE TA1	TA2	TA3	Attendance	ESE	Total					
	_	ST3		TA2 5	TA3 5	Attendance 5	ESE	Total					

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#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

<b>Course Code</b>	· RCSEM02	Course Name: Database Management	L	Т	P	С						
Course Code	: DCSEU4U2		L	1	Г							
		Systems										
Course Offer	red in:CSE/CSE-R/I	Γ/M.Tech Int./CSE (Twin)	3	0	0	3						
/IT(Twin)/CS	SE(Prof)/IT(Prof)/M	&C/AI/AI(TWIN)/ AIML/AIML(TWIN)/										
CS/CYS/DS/IOT												
Pre-requisite: It is recommended to have fundamental computer knowledge that includes												
computer arch	nitecture, storage and h	ardware. Knowledge of data structures and algo-	orithm	s and p	orogram	ming						
will be an add	led benefit.											
<b>Course Obje</b>	ctives: The objective	of the course is to introduce about database m	anage	ment								
systems, with	n an emphasis on ho	w to organize, maintain and retrieve - effic	iently	, and								
•	-	al & non-relational databases.	J	,								
<b>Course Outco</b>	ome-After completion	of this course students will be able to			Bloom's							
					Knowledge							
					Level (KL)							
CO 1	Apply ER model for	conceptual design of the database.			K3							
CO2	Execute SQL and ap	ply the normalization to improve the database of	design	•	К3							
CO3	Implement complex queries in database with different applications.											
CO4	CO4 Execute the concept of PL/SQL, transaction and concurrency control.											
CO5	<u> </u>	al and Non-Relational databases using different veness in real-world applications	tools	and	K5							

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1	-	1	2	1	2	2	1	2
CO2	3	2	3	3	2	2	-	2	1	2	2	3	2	2
CO3	3	3	2	3	3	2	-	2	1	-	2	3	2	3
CO4	3	2	2	2	2	2	-	-	1	1	1	3	2	2
CO5	2	2	2	2	3	2	-	-	1	2	2	3	3	3

#### **Course Contents / Syllabus**

Module 1	Introduction about the Database Conceptual Designing	8 hours

**Basic Concept:** Database system concept, architecture, History of Database, Data Independence, Database system Vs File system, Data models & Types of Data Models, schema and instances.

**Data Modelling using the Entity Relationship Model:** ER model concepts, Degree of relationship, Notation for ER diagram, mapping constraints, Generalization, Aggregation, Reduction of an ER diagrams to tables. Extended ER Diagram & reduction of EER. Codd Rules.

**Introduction on SQL:** Types of SQL commands: -DDL, DML, DCL, TCL. Basic of Relation Algebra & Operations, Query Optimization.

Module 2 Basic of SQL & Normalization 8 hours

**Keys & Types of Keys:** Super key, Candidate Key, Primary Key, Alternative Key, Foreign Key, unique. Constraints and Types of Constraints.

Use of Functions, Clause and Predicates: Aggregate Function, Scalar Functions, Where, Group by, Having and Order by, SQL Operators. Like, Between, Aliases, distinct, limit.

**Normalization:** Functional Dependencies, attribute Closure, Normalization & Types of Normalization, Candidate Key, Canonical Cover of FD's.

Module 3 Introduction of Complex Queries 8 hours

**Use of Operators:** Union, Intersect, Minus, Cartesian Product, join:-Inner Join: - Natural Join, Equi Join & Non Equi Join Outer Join: Left Outer Join, Right Outer Join and Full Outer Join, Division Operator.

**Nested Query or Sub Query:** IN, NOT IN, Exists, Not Exists, All and Any. Managing Indexes, Synonyms and Sequences, Managing Views.

**Introduction of PL/SQL:** Implementation of PL/SQL Function, Procedure, Trigger, Cursor. **Database connectivity:** Database Connectivity with Java/Python Programming Languages.

Module 4 Transaction and Concurrency Control 8 hours

**Transaction system:** Life cycle of transaction, ACID Properties Schedule & Types of Schedule, Serializability, Recoverability, Deadlock Handling.

Concurrency Control Techniques: Concurrency Control, Concurrency control Techniques: Locking Techniques, Timestamping, Validation Based Protocol, Transaction & Data Control: -Grant, Revoke, commit & Rollback.

Module 5 Introduction of NoSQL With MongoDB 8 hours

**Introduction of NoSQL With MongoDB**: Introduction of NoSQL Data Models, Overview of NoSQL Databases with their Types, Uses & Features of NoSQL Document Databases, CAP theorem, BASE Vs ACID, Comparison of relational databases to NoSQL stores, uses and deployment; - MongoDB, Cassandra, HBASE, Neo4j and Riak.

Introduction and Features of MongoDB, MongoDB Operators, MongoDB Collection & Document, MongoDB Shell & their commands, CRUD operations.

**Cloud Database**Introduction of Cloud Database. MongoDB Cloud product : Stitch, Atlas & Cloud Manager.

	Total Lecture Hours   40
Textbook:	
S.No	Book Title
1	Abraham Silberschatz, Henry Korth and S. Sudarshan, "Database Concepts", McGraw Hill,
	7th Edition, 2020
2	Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley, 7th edition, 2016
Reference l	Book
S.No	Book Title
1	Thomas Cannolly and Carolyn Begg, Database Systems: A practical Approach to Design,
1	Implementation and Management. Pearson Education, 3rd Edition, 2007.
2	Ted Hills, NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and
L	Software, Ted Hills, 1st Edition,2016.
NPTEL/ Y	outube/ Faculty Video Link:
Unit 1:	DBMS L1 Inauguration & Introduction (youtube.com)
	DBMS L2 Introduction to Relational Model (voutube.com)

	DBMS L3 Introduction to SQL (youtube.com)
	DBMS L8C Entity Relationship Model (youtube.com)
	DBMS L8D Entity Relationship Model (Problem Solving and Discussion)
	(youtube.com)
Unit 2:	DBMS L4A Joins, Set Operations and Aggregate Functions (youtube.com) DBMS
	L9A Relational Database Design - YouTube
	DBMS L9B Relational Database Design (youtube.com)
	DBMS L9C Relational Database Design (youtube.com)
	DBMS L9D Discussion on Normalization (youtube.com) Relational Data Model and
	Notion of Keys - YouTube Introduction to Relational Algebra (youtube.com)
	Operators in Relational Model – YouTube
Unit 3:	DBMS L4B Joins, Set Operations and Aggregate Functions (youtube.com)
	DBMS L5A Nested Subqueris (youtube.com)
	DBMS L6A Intermediate SQL (youtube.com)
	DBMS L7 Advanced SQL (youtube.com)
	DBMS L12A Indexing and Hashing (youtube.com)
Unit 4	DBMS L15 Transactions – YouTube
	DBMS L16A Concurrency Control - YouTube
	DBMS L16B Concurrency Control (youtube.com)
	DBMS L16C Concurrency Control (youtube.com)
Unit 5	DBMS L10A Application Design and Development - YouTube
	DBMS L10B Application Design and Development (youtube.com)
	DBMS L19 Distributed Data Stores and NoSQL Databases (youtube.com)
	DBMS L18B Map Reduce and Hadoop - YouTube
	NoSQL Databases #1 (Data Models, CAP Theorem, BASE Property) - YouTube
	https://youtu.be/ekuQjQUnj20?si=_aL4T12EkHBZsvEK

### **Mode of Evaluation**

	CIE								
ST1	ST2	ST3	TA1	TA2	TA3	Attendance			
			5	5	5	5			
	L	<u>I</u>		I	I				



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

<b>Course Code:</b>	Course Name: Data Structures and Algorithms-II	L	T	P	C	ĺ
BCSE0401						
Course Offered in: CSE/C	S/CSR-R/M.TECH(INT)	3	0	0	3	l
/IT//CSE(AI)/CSE(AIML)	/CSE(DS)/CSE(CS)				1	l

Pre-requisite: C, Python

#### **Course Objectives:**

The objective of the course is to learn the basic concepts of algorithm analysis, along with the implementation of non-linear data structures.

Course Outcome: After completion of the course, the student will be able to

S.No	Course Outcome	Bloom's
		Level
CO 1	Apply tree structures effectively demonstrating proficiency in tree operations and algorithms.	К3
CO 2	Analyse the graph data structure and implement various operations for problem solving.	K4
CO 3	Implementation and analysis of dynamic programming for efficient problem-solving across diverse contexts.	K4
CO 4	Apply efficient backtracking and branch &bound techniques across diverse problem-solving scenarios.	К3
CO 5	Understand advanced data structures, their implementation and application for efficient data manipulation and retrieval.	K2

CO-PO Mapping (Scale: 1: Low, 2: Medium, 3: High)

	11 0 \			-		-	0 /							
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	2	1	1	2	1	-	3	1	2
CO2	3	3	2	1	1	2	1	1	2	1	-	3	2	2
CO3	3	3	2	2	2	2	1	1	2	2	-	3	2	2
CO4	3	3	3	2	2	2	1	1	2	1	-	3	2	2
CO5	3	3	3	2	2	2	1	1	2	2	-	3	2	2

**Course Contents / Syllabus** 

Unit 1 Design and Analysis of Algorithms: Tree 8 hours

**Trees:** Terminology used with Trees, Binary 
Tree, Memory representation of Tree, Traversal Algorithms: In-order, Pre-order, and post-order. Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search tree, Binary Heaps, Threaded Binary trees, Traversing Threaded Binary trees, AVL Tree.

**Application Trees:**PriorityQueue,HeapSort, Huffman codes.

Unit 2	Design a	and Analysis of Algorithms: Graphs	8 hours

Graphs: Terminology used with Graph, DataStructure for Graph Representations: Adjacency matrices, Adjacency List. **Graph Traversal:** Depth First Search and Breadth First Search. Connected Component, Spanning Trees. AlgorithmsonGraphs: MinimumCost Spanning **Trees:** Prim's and Kruskal's algorithm. Directed- Acyclic Graph, Transitive Closure and Shortest Path algorithms: Dijkstra Algorithm, Bellman Ford Algorithm, Floyd Warshall's Algorithm. Unit 3 **Dynamic Programming** 8 hours Dynamic Programming: Dynamic Programming concepts 0/1 Knapsack, Longest Common Sub Sequence, Matrix Chain Multiplication, Resource Allocation Problem. Unit 4 **Backtracking, Branch and Bound** 8 hours Backtracking: Backtracking, Branch, and Bound with Examples Such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles, and Sum of Subsets. Unit 5 **Advanced- Data Structures** 8 hours Red-Black Trees, B – Trees, B+ Trees, Binomial Heaps, Fibonacci Heaps, Trie. **Total Lecture Hours** 40 hours Textbook: S.No. **Book Details** Michael T. Goodrich, Roberto Tamassia, "Data Structures and Algorithms in Python: An 1 Indian Adaptation", 1st Edition, 2021 Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. 2 Ltd, 2nd Edition, 2017. 3 Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India, 4th Edition, 2022 **Reference Books:** S.No. **Book Details** Reema Thareja, "Data Structure Using C", Oxford University Press, 2nd Edition, 2014. 1 AK Sharma, "Data Structure Using C", Pearson Education India, 2nd Edition, 2011. 2 3 P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication, 1st Edition, 2004. NPTEL/ YouTube/ Faculty Video Link: Unit 1 https://youtu.be/u5AXxR4GnRY https://www.youtube.com/watch?v=LQx9E2--p5c&pp=ygUMYXJyYXlzIG5wdGVs Unit 2 Unit 3 https://www.youtube.com/watch?v=K7VIK1Udo20&pp=ygUPbGluayBsaXN0IG5wdGVs Unit 4 https://www.youtube.com/watch?v=g1USSZVWDsY&list=PLB3CD0BBB95C1BF09&ind ex=2&pp=iAQB https://www.youtube.com/watch?v=THMyk2 p530&pp=ygUccXVldWUgZGF0YSBzdHJ1 Y3R1cmUgICBucHRlbA%3D%3D https://www.youtube.com/watch?v=\_VV9v41FIq0&pp=ygUZZGl2aWRIIGFuZCBjb25xd Unit 5 WVyICBucHRlbA%3D%3D https://www.youtube.com/watch?v=ARvQcqJ\_-NY&list=PLfFeAJvQopt\_S5XlayyvDFL\_mi2pGJE3 **Mode of Evaluation** 

		ESE	Total				
ST1	ST2	ST3	TA1	TA2	Attendance		
			5	5	5		
	35			15		100	150



## NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

<b>Course Code: BCSN</b>	/IL0401	Course Name	e: Machine Lo	earning		$\mathbf{L}$	$\mathbf{T}$	P	C
Course Offered in:	CSE(DS)					3	0	0	3
Pre-requisite: Basic	Knowledge	ofMachine lear	ning.						•
Course Objectives:	To introduc	tion to the fund	lamental conce	pts in machine le	earning and p	opular	machi	ne lear	rning
algorithms. To under	stand the sta	andard and mos	st popular supe	rvised learning a	lgorithm				
Course Outcome: A	fter comple	tion of the cour	rse, the student	will be able to	Bloom's Kn	owled	ge Lev	el (KL	<u>.)</u>
CO1		andingutilization		ntationproper		K	2		
CO2	Underst algorith	andthebasic ms.	supervisedn	nachinelearning		K	2		
CO3		andthedifferen		ervise		K	2		
CO4	mathem	candalgorithmic naticallydeep tointroducether	_	_		K	2		
CO5	11.	nappreciation gfrom data.	forwhat	isinvolvedin		K	3		
CO-PO Mapping (S	cale 1: Lov	v, 2: Medium,	3: High)		_				

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	-	-	-	2	2	1	2	3	2
CO2	3	3	2	3	3	-	-	-	2	2	1	2	3	3
CO3	3	3	2	3	3	-	-	-	2	2	1	2	3	3
CO4	3	3	2	3	3	-	-	-	2	2	1	2	3	2
CO5	3	3	2	3	3	-	-	-	2	2	1	2	3	2

**Course Contents / Syllabus** 

Module 1 INTRODUCTIONTOMACHINE LEARNING 08 hours

Introduction, Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension. Introduction to Model Building, Sensitivity Analysis, Underfitting and Overfitting, Bias and Variance, Concept Learning Task, IssuesinMachineLearning and Data Science Vs Machine Learning.

Module 2 SUPERVISED AND UNSUPERVISED LEARNING 08 hours

Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception, Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering.

AprioriAlgorithm: Marketbasketanalysis, Association Rules.

Module 3	ENSEMBLE AND PROBABILISTIC LEARNING	08 hours
Adaboost, Stacking. Gau	mes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trussian mixture models - The Expectation-Maximization (EM) Algorithm r methods - Nearest Neighbour Smoothing, Efficient Distance Computations	n, Information
Module 4	REINFORCEMENT LEARNING AND EVALUATING HYPOTHESES	08 hours
Relationship to Dynamic	ask, Q Learning, Nondeterministic Rewards and actions, temporal-difference Programming, Active reinforcement learning, Generalization in reinforcement mpling Theory: Error Estimation and Estimating Binomial Proportions, Bias, and Variance.	ment learning.
Module 5	GENETIC ALGORITHMS AND CASE STUDIES	08 hours
Illustrative Example, Hypo Lamarkian Evolution, Bald	rithms: Representing Hypotheses, Genetic Operator, Fitness Function and Seothesis Space Search, Genetic Programming, Models of Evolution and Learn dwin Effect, Parallelizing Genetic Algorithms.  E Commerce, Smart Cities.	
	Total Lecture Hours	48 hours
Textbook:		
	rning:AConstraint-BasedApproach,Morgan Kaufmann. 2017	
2)EthemAlpaydin,Machine	e Learning:TheNew AI,MITPress-2016	
	ralNetworksforPatternRecognition.NewYork,NY:OxfordUniversityPress,	
4)TomM.Mitchell,"Machi	ne Learning",McGraw-Hill, 2010	
S.No	Book Title Author	
Volume 1, Elsevier. 2014	G.CarbonellandTomM.Mitchell,MachineLearning:AnArtificial Intelligencer&Francis2009.Machine Learning:AnAlgorithmicPerspective.	e Approach,
Press. 4)FundamentalsofMachine	IntroductiontoMachineLearning(AdaptiveComputationandMachine LearningeLearningforPredictiveDataAnayltics:Algorithms,Worked Examples,and Ca	
Press. 4)FundamentalsofMachine Edition by John D. Kelleho	eLearningforPredictiveDataAnayltics:Algorithms,Worked Examples,and Ca	
Press. 4)FundamentalsofMachine	eLearningforPredictiveDataAnayltics:Algorithms,Worked Examples,and Caer  Book Title  Author	
Press. 4)FundamentalsofMachine Edition by John D. Kelleho S.No	eLearningforPredictiveDataAnayltics:Algorithms,Worked Examples,and Caer  Book Title  Author	ase Studies 1st
Press. 4)FundamentalsofMachine Edition by John D. Kelleho S.No NPTEL/ Youtube/ Faculty	eLearningforPredictiveDataAnayltics:Algorithms,Worked Examples,and Caer  Book Title  Video Link:  https://www.youtube.com/watch?v=fC7V8QsPBec&list=PL1xHD4vteKY	XVpaliy295pg  KYVpaliy295  be.com/watch?

	https://www.youtube.com/watch?v=NnlS2BzXvyMhttps://www.youtube.com/watch?v=
	<u>7enWesSofhg</u>
Unit4	https://youtu.be/rthuFS5LSOo
	https://youtu.be/kho6oANGu_A
Unit5	https://www.youtube.com/watch?v=9vMpHk44XXo&list=PL1xHD4vteKYVpaIiy295p
	g6 SY5qznc77&index=5
	ReinforcementLearningTutorial ReinforcementLearningExampleUsingPython Edurek
	<u>a - YouTube</u>
	<u>AssociationRuleMining-SolvedNumericalQuestiononAprioriAlgorithm(Hindi) -</u>
	<u>YouTube</u>
	<u>QLearningExplained ReinforcementLearningUsingPython QLearning</u>
	in AI   Edureka - YouTube

### **Mode of Evaluation**

		ESE	Total					
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
	30	100	150					



# NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BASL0401N	Course Name: Technical Communication	L	Т		P
Course Offered in: B. Teo	ch. All branches (except CSBS)	2	0	0	2

Pre-requisite: Intermediate level (CEFR) and above

#### Course Objectives:

- 1. **Demonstrate effective verbal and non-verbal communication skills** in diverse professional settings, including meetings, presentations, and interpersonal interactions.
- 2. **Develop and apply clear, concise, and audience-appropriate written communication**, such as emails, letters, memos, resume', using correct grammar, tone, and format.
- 3. Adapt communication style based on cultural, organizational, and situational contexts to foster inclusive and respectful professional relationships.
- **4.** Employ digital communication tools and platforms (e.g., video conferencing, business messaging apps) responsibly and effectively in remote or hybrid work environments.

Course	Outcome: After completion of the course, the student will be able to	Bloom'sKnowledge Level(KL)
CO1	Comprehend the principles and functions of technical communication.	K2
CO2	Write for specific audience and purpose to fulfil the provided brief	K3
CO3	Recognize and produce different kinds of technical documents.	K3
CO4	Apply effective speaking skills to efficiently carry out official discourses.	K3
CO5	Demonstrate their understanding of communication through digital media.	К3

#### CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO- PO Mappi ng	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	2	1	2	3	1	1	-	-	2
CO2	1	1	1	1	1	1	1	2	3	1	1	-	-	2
CO3	1	1	1	1	1	1	1	2	3	1	1	-	-	2
CO4	1	1	1	1	1	1	1	2	3	1	1	-	-	2

CO5	1	1	1	1	1	1	1	2	3	1	1	-	-	2
Course C	ontents	s / Syll	abus											
Module 1			Introd	luction	to Tec	hnical	Comm	unicatio	on				4 Hour	·s
						• •								nunication: nunication
Module 2			Techn	ical W	riting 1	-							5 Hour	·s
Technical & Minute		_		eristics,	examp	les; <b>Bu</b>	siness l	etters/c	emails:	Conten	t organi	ization,	Tone a	nd intent; Agenda
Module 3			Techn	ical W	riting 2	<u>,                                      </u>							5 Hour	·s
<b>Job appli</b> Plagiarism		Resur	ne'; Rep	ort, pro	posal;	Techn	ical pa	per: Ab	stract; ]	Ethical	Writin	ı <b>g:</b> Cop	y Editin	g, Referencing and
Module 4			Public	Speak	ing								6 Hour	·s
Module 5 Remote w			Virtua	al/Remo	ote Cor	nmuni	cation	al etiqu	ette: en	nail ids,	userna	mes; W	4 Hour	rs Blogs & creating
Total Lec	ture H	ours											24 Hou	irs
Textbool	<b>K:</b>													
1			Commun andPracti			oyMeen	nakshiR	aman&	Sangee	taSharn	na,Oxfo	ordUniv	v.Press, 2	2022, New Delhi.
Reference	eBook	s:												
1	Tech	nicalC	ommunio	cation,1	5 <sup>th</sup> Editi	onbyJo	hnM.L	annon&	LauraJ	.Gurak,	Pearsor	n,2021		
2		enEng nualof		ndPhone	etics(5 <sup>th</sup>	Edition	n)byRK	Bansal	&JBHaı	rrison,C	)rientBl	ackswa	n,2024,	New Delhi.
3	l l		orrespond taMcGra		•		~ •		arma,K	rishnaM	Iohan,a	ndVire	ndraSin	ghNirban(6
4	Inte	rcultuı	ralComm	unicatio	oninVir	tualExc	changeb	yFranc	escaHe	lm,Cam	bridgel	Univ.Pr	ess,202	4.
NPTEL/	Youtub	e/Facu	ltyVideo	Link:										
Unit1	1.44	s://onli												

Unit2	https://archive.nptel.ac.in/courses/109/106/109106094/
Unit3	https://www.youtube.com/watch?v=kOJlwMJxEG0&t=8s
Unit4	https://www.youtube.com/watch?v=Sg7Q_dC_fWU&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb
Unit5	https://www.youtube.com/watch?v=ymLFJDpjgCk&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb&index =6
N/L-JCE-	

#### ModeofEvaluation

			ESE	Total			
ST1	ST2	ST3	TA1 5	TA 2 5	Attendance 10		
	30				50	100	



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

Course Code: BCSCY0311	Course Name: Fundamentals of Cyber Security	L	T	P	С
Course Offered in: CSE(DS)		2	0	0	2

Pre-requisite: Basic knowledge of Computer Systems, Familiarity with Internet Usage and Web Browsing.

#### **Course Objectives:**

To introduce the fundamental concepts and scope of cyber security, attacks, and vulnerabilities and explore basic security mechanisms and protective technologies to prepare the students for future learning in advanced security domains.

Course Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level
	(KL)
<b>CO1:</b> Understand the basic principles and terminology of cyber security.	K1
CO2: Recognize common cyber threats and attack vectors.	K2
CO3: Demonstrate knowledge of basic cyber defense tools and techniques.	K3
<b>CO4:</b> Adopt safe online behavior and promote cyber hygiene.	K3

#### CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	802	PSO3
CO1	3	2	1	1	1	1	-	1	-	1	-	2	-	2	1
CO2	3	3	2	2	2	2	-	2	-	2	-	2	2	3	2
CO3	3	3	3	2	3	1	-	3	2	2	1	3	3	3	3
CO4	2	2	2	1	2	2	1	3	2	2	-	3	-	3	3

**Course Contents / Syllabus** 

Module 1 Introduction to Cyber Security 8 hours

Definition, Evolution, and Need of Cyber Security, Difference between Information Security and Cyber Security, Cyber Forensics, The CIA Triad (Confidentiality, Integrity and Availability), Basic Terminologies: Threats, Vulnerabilities, Exploits, Risks, Cyber Security Objectives: Prevention, Detection, Response and Recovery, Cyber Security Domains: Network Security, Information Security, Application Security, Cloud Security and IoT Security, Security Goals, Roles of Security Policies, Procedures, and Awareness.

Module 2 Cyber Threats and Attacks 8 hours

Malware Types: Virus, Worm, Trojan Horse, Ransomware, Spyware, Adware, Social Engineering Attacks: Phishing, Baiting, Pretexting, Tailgating, Web-Based Attacks: SQL Injection, Cross-Site Scripting (XSS), Clickjacking, Network Attacks: Denial-of-Service (DoS), DDoS, Spoofing, Sniffing, Insider threats and APTs (Advanced Persistent Threats), Emerging Threats: IoT Vulnerabilities, Mobile Threats.

Module 3 Cyber Defense Mechanisms 8 hours

**Authentication Mechanisms:**Passwords, OTPs, Biometrics, **Access Control Models:** DAC, MAC, RBAC, **Firewalls:**Types, Configurations, Limitations, Intrusion Detection and Prevention Systems (IDS/IPS), **Cryptography:** Basic Idea of Encryption and Decryption, **Endpoint Protection:**Antivirus, Anti-Malware, **Backup Types:**Full, Incremental, Differential, Incident Response Basics.

Module 4 Network & System Security Basics 6 hours

**Basic Network Security Concepts:** IP, MAC, Ports, Protocols (HTTP, HTTPS, FTP), **Network Security Devices:**Routers, Switches, Firewalls, Proxies, **Secure System Configuration:** OS Hardening, User Privileges, Patch Management and Software Updates, Secure Coding Principles and Common Software Flaws, Safe Browsing Habits, Secure Downloads, Email Security.

Total Lecture Hours	30 hours
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#### Textbook:

- William Stallings Cybersecurity: Principles and Practice, Pearson.
   Chuck Easttom Computer Security Fundamentals, Pearson.

#### **Reference Books:**

- 1. Fundamentals of Cyber Security, CRC Press 2. Cyber Security, Wiley India

# NPTEL/YouTube/Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=z5nc9MDbvkw
Unit 2	https://nptel.ac.in/courses/106106129
Unit 3	https://www.youtube.com/watch?v=BdluJhRaAMA
Unit 4	https://nptel.ac.in/courses/106105183

#### **Mode of Evaluation**

		ESE	Total				
ST1	ST2	ST3	TA1	TA2	Attendance		
			5	5	10		
	30			20		50	100



#### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

Course Code: BCSE0411	Course Name: PYTHON WEB DEVELOPMENT WITH DJANGO	L	T	P	С
Course Offered in:CSE/CSI	E(R)/ CSE(TWIN)/ IT/ IT(TWIN)/ M.Tech(Int.)	3	0	0	3

**Pre-requisite:** Students should have good knowledge of Python Programming and Python coding experience.

**Course Objective:** This course focuses on how to design and build statistics as well as dynamic webpages and interactive web-based applications. These courses mainly focus on how Python operates within web development using the increasingly popular Django framework.

Course O	utcome- After completion of the course, the student will be able to	Bloom's
		Knowledge
		Level (KL)
CO 1	Apply the knowledge of python programing that are vital in understanding Django application and analyze the concepts, principles and methods in current client-side technology to implement Django application over the web.	K3,K6
CO 2	Demonstrate web application framework i.e. Django to design and implement typical dynamic web pages and interactive web based applications.	K3, K6
CO 3	Implementing and analyzing the concept of Integrating Accounts & Authentication on Django.	K3, K4
CO 4	Understand the impact of web designing by database connectivity with SQLite in the current market place where everyone uses to prefer electronic medium for shoping, commerce, and even social life also.	K2, K3
CO 5	Analyzing and creating a functional website in Django and deploy Django Web Application on Cloud.	K3, K6

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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	1	3	-	1	3	-	3	3	3	2	1
CO2	2	2	3	1	3	-	1	-	-	2	3	3	3	2
CO3	2	2	2	2	2	-	-	2	-	2	2	2	2	2
CO4	2	1	2	1	2	-	-	1	1	2	2	2	3	2
CO5	2	1	3	2	3	-	-	3	2	3	3	3	3	3

#### **Course Contents / Syllabus**

Module 1Python libraries for web development8 hours

Collections-Container datatypes, Tkinter-GUI applications, Requests-HTTP requests, BeautifulSoup4-web scraping, Scrapy, Zappa, Dash, CherryPy, Turbo Gears, Flask, Web2Py, Bottle, Falcon, Cubic Web, Quixote, Pyramid.

Module 2 Introduction to Django Framework 8 hours

Understanding Django environment, Features of Django and Django architecture, MVC and MTV, Urls and Views, Mapping the views to URLs, Django Template, Template inheritance Django Models, Creating model for site, Converting the model into a table, Fields in Models, Integrating Bootstrap into Django, Creating tables, Creating grids, Creating carousels.

Module 3	3 Integrating Accounts & Authentication on Django	8 hours
using Dja	tion to Django Authentication System, Security Problem & Solution with Django Creating Registrat ango, Adding Email Field in Forms, Configuring email settings, Sending emails with Django, Addir On Registration Page, Adding Page Restrictions, Login Functionality Test and Logout.	
Module 4	4 Connecting SQLite with Django	8 hours
from url	e Migrations, Fetch Data From Database, Displaying Data On Templates, Adding Condition On Data to view, Sending data from view to template, Saving objects into database, Sorting objects, Filt objects, Difference between session and cookie, Creating sessions and cookies in Django.	•
Module :		8 hours
	a functional website in Django, Four Important Pillars to Deploy, registering on Heroku and GitHub	
from Loc	cal System to GitHub, Working with Django Heroku, Working with Static Root, Handling WSGI vp Database & adding users.	
	Total Lecture Hours	40 hours
Textbool		
S.No	Book Title	
1	Martin C. Brown, "Python: The Complete Reference Paperback", 4 <sup>th</sup> Edition 2018, McGraw Hill Publication.	
2	Reema Thareja, "Python Programming: Using Problem Solving Approach", 3 <sup>rd</sup> Edition 2017, Oxtuniversity Press Publication.	ford
3	Daniel Rubio, Apress," Beginning Django Web Application Development and Deployment with Edition 2017, Apress Publication.	Python", 2 <sup>nd</sup>
4	William Jordon, "Python Django Web Development: The Ultimate Django web framework guid Beginners", 2 <sup>nd</sup> Edition 2019, Kindl e Edition.	le for
Referenc	e Books	
S.No		
1	Tom Aratyn, "Building Django 2.0 Web Applications: Create enterprise-grade, scalable Python wapplications easily with Django 2.0", 2nd Edition 2018, and Packt Publishing.	veb
2	Nigel George, "Build a website with Django", 1st Edition 2019, GNW Independent Publishing Ed	lition.
3	Ray Yao," Django in 8 Hours: For Beginners, Learn Coding Fast! 2 <sup>nd</sup> Edition 2020, independently Edition.	y published
4	Harry Percival, "Test-Driven Development with Python: Obey the Testing Goat: Using Django, S JavaScript", 2nd Edition 2019, Kindle Edition.	Selenium, and
	NPTEL/ YouTube/ Faculty Video Link:	
1.	https://youtu.be/eoPsX7MKfe8?list=PLIdgECt554OVFKXRpo_kuI0XpUQKk0ycO https://youtu.be/tA42nHmmEKw?list=PLh2mXjKcTPSACrQxPM2_10jus5HX88ht7 https://youtu.be/8ndsDXohLMQ?list=PLDsnL5pk7-N_9oy2RN4A65Z-PEnvtc7rf https://youtu.be/QXeEoD0pB3E?list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3 https://youtu.be/9MmC_uGjBsM?list=PL3pGy4HtqwD02GVgM96-V0sq4_DSinqv	<u>vf</u>
2.	https://youtu.be/F5mRW0jo-U4 https://youtu.be/yD0_1DPmfKM?list=PLQVvvaa0QuDe9nqlirjacLkBYdgc2inh3 https://youtu.be/rHux0gMZ3Eg https://youtu.be/jBzwzrDvZ18 https://youtu.be/RiMRJMbLZmg	
3.	https://youtu.be/8DF1zJA7cfc https://youtu.be/CTrVDi3tt8o	

	https://youtu.be/FzGTpnI5tpo https://youtu.be/z4lfVsb_7MA https://youtu.be/WuyKxdLcw3w
4.	https://youtu.be/UxTwFMZ4r5k https://youtu.be/2Oe55iXjZQI https://youtu.be/zV8GOI5Zd6E https://youtu.be/uf2tdzh7Bq4 https://youtu.be/RzkVbz7Ie44
5.	https://youtu.be/kBwhtEIXGII https://youtu.be/Q_YOYNiSVDY https://youtu.be/_3AKAdHUY1M https://youtu.be/6DI_7Zja8Zc https://youtu.be/UkokhawLKDU

# Mode of Evaluation

		ESE	Total					
ST1	ST2	ST3	TA1	TA2	TA3	Attendance		
			5	5	5	5		
30 20							50	100



# NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BCSDS0412	Course Name: Business Intelligence and Data	L	T	P	С
	Visualization				
Course Offered in: CSE(DS)		3	0	0	3

**Pre-requisite:** Basic Knowledge of Business intelligence.

**Course Objectives:** This course covers fundamental concepts of Business Intelligence tools, techniques, components and its future. As well as a bit more formal understanding of data visualization concepts and techniques. The underlying theme in the course is feature of Tableau, its capabilities.

Course	Outcome: After completion of the course, the student will be able to	Bloom's Knowledge
		Level (KL)
CO1	Apply quantitative modelling and data analysis techniques to the solution of real-world business problems.	К3
CO2	Understand the importance of data visualization and the design and use of many visual components.	K2
CO3	Understand as products integrate defining various analytical process flow.	K2
CO4	Learn the basics of troubleshooting and creating charts using various formatting tools.	K6
CO5	Learn basics of structuring data and creating dashboard stories adding interactivity dashboard stories.	K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	1	-	1	-	2	2	3	2
CO2	3	3	3	3	2	2	1	-	1	1	2	2	3	2
CO3	3	3	3	3	3	2	2	-	2	1	2	2	3	3
CO4	3	3	3	3	3	2	2	1	2	1	2	3	3	3
CO5	3	3	3	3	3	2	2	1	2	1	2	3	3	3

Course Contents / Syllabus

Module 1 INTRODUCTION TO BUSINESS INTELLIGENCE 8 hours

Business Intelligence (BI), Scope of BI solutions and their fitting into existing infrastructure, BI Components and architecture, BI Components, Future of Business Intelligence, Functional areas of BI tools, End user assumptions, setting up data for BI, Data warehouse, OLAP and advanced analytics, Supporting the requirements of senior executives including performance management.

#### Module 2 ELEMENTS OF BUSINESS INTELLIGENCE SOLUTIONS 8 hours

Business Query and Reporting, Reporting, Dashboards and Scorecards Development, Development, Scorecards, Metadata models, Automated Tasks and Events, Mobile Business Intelligence, Software development kit (SDK). Stages of Business Intelligence Projects, Project Tasks, Risk Management and Mitigation, Cost justifying BI solutions and measuring success, BI Design and Development, Building Reports, Building a Report, Drill-up, Drill-down Capabilities.

Module 3 TABLEAU 8 hours

**Introductions and overview:** What Tableau can and cannot do well, Debug and troubleshoot installation and configuration of the software.

**Creating Your First visualization:** Getting started with Tableau Software, Using Data file formats, connecting your Data to Tableau, Introduction to Dimensions and Measures, creating basic charts (line, bar charts, Tree maps), Using the Show me panel, Combo Charts-Dual Axis

**Tableau Calculations:** Overview of SUM, AVR, and Aggregate features Creating custom calculations and fields, Applying new data calculations to your visualization, Introduction to Level of Detail (LOD)

Formatting Visualizations: Formatting Tools and Menus, formatting specific parts of the view, Editing and Formatting Axes.

#### Module 4 DATA VISUALIZATION 8 hours

Manipulating Data in Tableau: Cleaning-up the data with the Data Interpreter, structuring your data, Sorting Tableau data, Pivoting Tableau data.

**Advanced Visualization Tools:** Using Filters, Using the Detail panel Using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colours.

Creating Dashboards & Stories: Using Storytelling, creating your first dashboard and Story, Design for different displays, Adding interactivity to your Dashboard

**Distributing & Publishing Your Visualization:** Tableau file types, Publishing to Tableau Online, sharing your visualization, Printing, and exporting.

Given a case study: Perform Interactive Data Visualization with Tableau

#### Module 5 INTRODUCTION TO POWER BI 8 hours

Describe the Power BI ecosystem, Define Power BI and its relationship with Excel, Discuss the Power BI suite of products, Describe how the Power BI products integrate, Explain the typical analytics process flow, Differentiate between the various data sources, Connect Power BI to a data source, DAX, Clean and transform data to ensure data quality, Load the data to the Power BI Data Model.

**Total Lecture Hours** 

48 hours

Textbool	k:	
S.No	Book Title	Author
1.	"Decision Support and Business Intelligence Systems", 9th Edition,	Efraim Turban, Ramesh Sharda, Dursun
	Pearson 2013.	Delen.
2.	Learning Tableau 10 - Second Edition: "Business Intelligence and data	Joshua N. Milligan.
	visualization that brings your business into focus".	
3.	Tableau Your Data!	Daniel G. Murray and the Inter Works BI
		Team-Wiley.

#### **Reference Books:**

S.No	Book Title	Author
1.	"Business Intelligence Roadmap: The Complete Project Lifecycle of	Larissa T. Moss, S. Atre
	Decision Making", Addison Wesley, 2003.	
2.	"Business Intelligence: Data Mining and Optimization for Decision	Carlo Vercellis
	Making", Wiley Publications, 2009.	
3.	"Business Intelligence: The Savvy Manager"s Guide", Second Edition,	David Loshin Morgan, Kaufman
	2012.	
MOTEL	/ X/ 4 - 1 - / E 14 - X/: 1 I : - 1	

#### NPTEL/ Youtube/ Faculty Video Link:

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Unit 1	Introduction to Business Intelligence - YouTube
Unit 2	Business Intelligence Tutorial - YouTube
Unit 3	What Is Power BI?   Introduction To Microsoft Power BI   Power BI Training   Edureka - YouTube
Unit 4	https://www.tableau.com/academic/students
Unit 5	Top 10 Data Visualization Tools in 2020   Best Tools for Data Visualization   Edureka - YouTube Learn Data Visualization Using Tableau   Tableau Tutorial   Tableau   Edureka Live - YouTube

Mode of Evaluation											
			ESE	Total							
ST1	ST2	ST3	TA1	TA2	TA3	Attendance					
			5	5	5	5					
	30	100	150								



### **GREATER NOIDA-201306**

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

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Course						Course	Name:	Introdu	iction to	Cloud	Comput	ting		L	T	P	С
Course			` /											3	0	0	3
Pre-req	uisite:	Knowle	edge of	basic co	mputin	g units											
	-									d techn	ologies (	of cloud	comput	ting, en	abli	ng	
foundat	ional u	ndersta	anding o	of cloud	-based	services	and in	frastru	cture.								
Course (	Outcom	ne: After	comple	etion of	the cour	se, the s	tudent v	vill be a	ble to					Bloo	m's I	(Inow	edge
														Leve	l (KI	ر)	
CO1							puting a		olution	•						(2	
													<u> </u>				
<ul> <li>CO3 Understand architectural principles and standards in cloud design.</li> <li>CO4 Relate cloud resources and enable interoperability.</li> </ul>														<u> </u>			
CO4 CO5							ibility.									<u>K2</u> K2	
CO-PO					ud com Jedium		h)								г	12	
		ing (bea		1		, 3. mg	l)									0002	1
CO-PO Mappin	O-PO   PO1   PO2   PO3   PO4   PO5   PO6   PO7   PO8   PO9   PO10   PO11   PSC											PSO1	PSO2	2	SO3		
CO1		1	1	-	-	•	-	•	-	-	•	2					
CO2		2	2	1	1	•	•	1	1	-	2	2					
CO3		1	2	2	2	1	2	2	1	-	2	2					
CO4		2	2	3	2	2	3	2	2	1	3	2					
CO5		2	3	3	2	3	3	2	2	1	2	2					
Course	Conter	nts / Syl	labus						ı								
Module	1			Intro	oduction	n to Clo	ud									10 ho	ars
Introduc	tion to	Cloud	Compu	ting, D	efinition	of Clo	oud, Ev	olution	of Clou	ıd Com	puting, I	Jnderlyi	ng Prin	ciples	of P	arallel	and
Distribu	ted Co	mputing	g, Cloud	, Chara	cteristic	s, Multi	-tenancy	y & Ela	asticity i	n Cloud	d, On-de	mand Pr	ovisioni	ng, Clo	oud (	econo	mics,
Merits o	f Cloud	d compu	iting, Ol	ostacles	for clou	d techno	ology, C	loud vu	lnerabil	ities, Clo	oud chall	enges.					
Module							Deploy									10 ho	
											e Model						
								-		k Storag	ge, Relati	onal Dat	tabase So	ervices	, Virt	ual Pr	ivate
Cloud, V		Machine	es, Clou		), Manag ı <b>d Arch</b> i			aged sei	rvices.							10 ho	IIPC
		Arabita	oturo D					Dafaran	aa Arab	itaatura	Service	Laval A	graaman	t Dolo			
											Oriented						
Subscrib									,							-,	
Module	4			Clou	ıd Resor	urce Ma	anagem	ent								9 hou	rs
Inter Clo	oud Res	ource N	lanagen	nent, Re	source P	rovisio	ning and	Resour	ce Provi	sioning	Methods	, Global	Exchang	ge of C	loud	Resou	rces,
Interope	rability	, Portab	oility, M	ligration	in clou	d, Disa	ster Rec	overy,	Federati	on in th	e Cloud,	Four L	evels of	Federa	ition,	Fede	rated
Services	and A	pplication	ons, Fut	ure of F	ederatio	n											
Module	Module 5 Security in Cloud 9 hours																
Security	Overv	iew: Clo	oud Secu	rity Cha	allenges,	, Softwa	re-as-a-	Service	Security	, Securi	ty Gover	nance, I	AM, Sec	curity S	tanda	ards, N	ЛFA,
Authenti	ication	and Aut	thorizati	on, CIA	, Introdi	uction to	) Firewa	ll, Secu	rity Gro	up, Use	r & Acce	ss contro	ol, open	Source	& C	omme	ercial
Engine, Scaling and Monitoring instances, serverless computing, Programming Environment for Google App Engine, Open Stack.																	
												Tota	l Lectur	e Hou	rs	48 ho	ars
Textboo	Textbook:																
S.No	Boo	ok Title									Aut	hor					
											•						

1.	Fundamentals of C	Cloud Compu	ting, Nitya Pub	olication, 2	020		Dr. Arun Singh Choul	an, Bipin Pandey,
						,	Vishwas Srivastava	-
2.	Cloud Computing	Basics: A No	n-Technical In	troduction	, Apress,	2022	Anders Lisdorf	
Refer	rence Books:							
S.No	Book Title						Author	
1.	Cloud Computing	revised and u	pdated edition	, 2023			Nayan B. Ruparelia	
NPTEL/	Youtube/ Facult	y Video Li	nk:			<u> </u>		
1.	https://nptel	.ac.in/cours	es/106/104/2	1061041	82/			
	https://www	•		_				
	https://www	youtube.co	om/watch?v=	=JYq1A0	QkMdhl	Ξ		
	https://www	youtube.co	om/watch?v=	=iSG_72	VNBVs	s&t=55s		
2.	https://nptel	.ac.in/cours	es/106/105/2	1061051	67/			
	https://youtu	ı.be/FZR0r0	G3HKIk?si=	i9013Td	IeWtC-	UUJ		
3.	https://aws.a	mazon.con	n/					
	https://www	youtube.co	om/watch?v=	=36zducl	JX16w			
	https://www	youtube.co	om/watch?v=	=3WIJ4a	xzFlU			
4.	4 https://ww	w.youtube.	com/watch?	v=m8iz4	CFVW	<b>K</b> 0		
	https://www	youtube.co	om/watch?v=	=IKxigcb	hsGk			
	https://www	youtube.co	om/watch?v=	=NbkPR1	n1mqlU			
5.	https://youtu	ıbe.com/pla	ylist?list=PI	L1TLTE	HdRxD	bFyipEb0K	ENRuBTI9yUu26	&si=Si2LGUG6
	fu6v0Jr3						<u> </u>	
Mode of	Evaluation							
			CIE				ESE	Total
ST1	ST2	ST3	TA1	TA2	TA3	Attendance	e	
			_	_	_	_		



### NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

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C

										-							_
Course Int./CSI CS/CYS	E(Tv	vin)/IT(					f)/M&	:C/AI/	AI(TW	/ <b>IN</b> )/ A	AIML/A	IML(T	WIN)/	0	0	4	2
re-req	uisit	e: Basi	c know	vledge	of com	puter f	fundam	nentals,	progra	ammin	g, data s	tructure	s, relatio	nal data	base	conc	epts.
Course	Obje	ectives:	To far	niliariz	ze the s	tudents	s to the	basics	of Da	tabase	Design	and Imp	lementa	tion.			
Course	Out	comes (	CO)														
After co	-	etion of													K	loom nowl evel (	edge
CO1	usii	ng appro	opriate	databa	ise tool	lS.							relationa				
CO2	trıg	pply SQL and PL/SQL to create complex data queries, and procedural operations comprising gers and functions, along with database connectivity.															
CO3	Мо	ngoDB	with a	ppropr	iate qu	ery ope	eration	S.	and in	npleme	ent unst	ructured	d databa	ises usi	ng K	4	
	Ma	pping (	Scale 1	1: Low	7, 2: M	<u>edium</u>	<u>, 3: Hi</u>	gh)		1		1					
O-PO Iappin	g	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PSO1	PSO2	P	SO3	
CO <sub>1</sub>		3	3	3	3	2	1	-	1	2	1	2	3	2			2
CO2	2,	3	3	3	3	2	2	-	2	1	2	2	3	2			2
CO3	}	2	2	2	2	3	2	_	-	1	2	2	3	3			2
r. No		Progra	am Tit	le													
		Unders	stand a	nd imp	lement	the di	fferent	ER dia	agram i	notatio	n with t	neir rela	tionship	and Car	dina	lities.	
,			s and c	lepend									ies like e etween th				
3		Implen	nent D	DL, DI	ML, D	CL & 7	ΓCL co	omman	ds								
ļ		Implenand on							y, com	posite	primary	key, Fo	reign Ke	y with o	on de	lete s	et nu
5		Implen	nentati	on of E	Busines	s Cons	straint:	Null, N	Not Nu	ll, Def	ault, Ch	eck.					

Practicing Queries using Like, Between, Aliases, distinct Operator & Predicate. And Implement Aggregate

Create a table EMPLOYEE with following schema:-(Emp\_no, E\_name, E\_address, E\_ph\_no, Dept\_no,

Implementation of Queries using Where, Group by, Having and Order by Clause.

i. List the E\_no, E name, Salary of all employees working for MANAGER.

Dept\_name, Job\_id, Designation, Salary)

Write SQL statements for the following query.

	ii. Display all the details of the employee whose salary is more than the Sal of any IT PROFF.
	iii. List the employees in the ascending order of Designations of those joined after 1981.
	iv. List the employees along with their Experience and Daily
	v. List the employee who are either 'CLERK' or 'ANALYST'.
	vi. List the employees who joined on 1-MAY-81, 3-DEC-81, 17-DEC-81.
	vii. List the ename those are starting with 'S'.
	viii. Display total salary spent for each job category.
	ix. Display lowest paid employee details under each manager.
	x. Display number of employees working in each department and their
	department name.
	xi. Display the details of employees sorting the salary in increasing order.
	xii. Show the record of employee earning salary greater than 16000 in each
	department.
	xiii. Add constraints to check, while entering the empno value
	(i.e) empno> 100.
	xiv. Define the field DEPTNO as unique.
	Create a primary key constraint for the column (EMPNO).
	Implementation of Queries using set theory operators UNION, INTERSECT, MINUS.
9	implementation of Queries using set theory operators of thort, in the interest of the interest
10	Implementation of Queries using Inner Join:- Natural Join, Equi Join & Non Equi Join, Outer Join
11	Implementation of Queries nested Queries or Sub Queries: - IN, NOT IN, Exists, Not Exists, All and Any.
	1. Apply the set theory operators, join's and nested queries on company database (Case Study-1)
	Write the SQL Queries for the following statement.
	I. Retrieve the names of employees in department 5 who work more than 10 hours per week on the
	'ProductX'project.
	II. List the names of employees who have a dependent with the same first name as themselves.
	III. Find the names of employees that are directly supervised by 'Franklin Wong'.
	IV. For each project, list the project name and the total hours per week (by all employees) spent on that
	project.
	V. Retrieve the names of all employees who work on every project controlled by department 5.
12	VI. Retrieve the names of all employees who do not work on every project
	VII. For each department, retrieve the department name, and the average salary of employees working in
	that department.
	III. Retrieve the average salary of all female employees.
1	IX. Find the names and addresses of all employees who work on at least one project located in Houston
1	
	but whose department has no location in Houston.
	X. List the last names of department managers who have no dependents.
	XI. Retrieve the names of all employees who work in the department that has the employee with the
	highest salary among all employees.
13	Understand & implement the Database Connectivity with Java/Python etc. programming language
	Implementation and apply all the set theory operators, join and nested queries concept on Case study 1.
	impromentation and appry an the set theory operators, join and nested queries concept on case study 1.
	I. Make a list of all project members for projects that involve an employee whose name is SCOTT
	either as a worker or as a manager of the department that controls the project.
	II. To retrieve the Social Security numbers of all employees who either work in department 5 or directly
14	supervise an employee who works in department 5.
1	III. To retrieve the SSN of all employee who work as a supervisor not a manager.
1	IV. We want a list of all employee names as well as the name of the departments they manage if they
	happen to manage a department; if they do not manage one, we can indicate it with a NULL value.
	v. Retrieve the names of employees who have no dependents.
	VI. List the names of all employees with two or more dependents.
	VII. List the names of managers who have at least one dependent.

		mployees who do not have supervisors. employee who has a dependent with the same Last name	as the employee									
15	Implementation of Indexing, View		as the employee.									
16 17	Write a Pl/SQL code block to calcu											
18	columns Radius and Area.  Write a PL/SQL code block that w	ill accept an account number from the user, check if the										
19	less than the minimum balance, only then deduct Rs.100/- from the balance.  Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:											
20	Implementation of commit and roll	back statement with amount transfer example.										
21	Implementation array, indexing, tra  I. Implementation of Array II. Implementation of Sequence	Functions & Operators nce efinition uplex Views es dexes										
22	• •	tabase and installation of MongoDB										
23	Implementation of the MongoDB S	Shell commands										
24	Implementation of the CRUD Oper	ration in MongoDB										
25	Implementation of Aggregate in M	ongoDB										
26	Implementation of case Study on d I. E-commerce Platform II. Inventory Management III. Railway System IV. Hospital Data Management V. Voice-based Transport Enquest VI. SMS-based Remote Server											
			1 77 20 1									
		Tota Mode of Evaluation	l Hours: 30 hrs.									
	CIE PS	PE (If mentioned in curriculum)	Total									
	50	50	100									



**LAB Course Code:** 

2

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### NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

LAB Course Name: Data Structures and

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

BCSE0451				Algorithms-II Lab								0	0	2	1	
Course Off				SR-R/	M.TE	CH(IN	T) /IT	//CSE	(AI)/C	SE(AIN	IL)/CSI	E(DS)/CS	SE(CS)	•		
Pre-requisi			l													
Course Ob	,															
1. Learn to i	ımplen	nent no	n-line	ar data	structu	res.										
Course Ou	tcome	After	compl	etion o	f the co	ourse, t	he stud	lent wi	ll be at	ole to			Bl	oom's		
			•										K	Knowledge		
														evel (K	L)	
CO1											operation	ons like	K.	3		
				inserti	on, del	etion,	searchi	ng and	traver	sal						
CO2				Imple	mentat	ion of	algoritl	ıms ha	sed on	oranh d	ata struc	tures for	K'	K3		
CO2				•			_		oca on	grupii u	ata struc		13.	IXJ		
				solving real world problems.												
CO3				Implementing Dynamic Programming, Backtracking, Branch and Bound algorithms to solve complex data efficiently and									d K	K3		
					_	thms t	o solve	comp	lex data	a efficie	ntly and					
				effecti	vely.											
CO-PO Ma	pping	(Scale	1: Lo	w, 2: N	<b>Iediu</b> n	n, 3: H	(igh)						ı			
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PS PS	О3	
CO1	3	3	2	1	1	2	1	1	2	1	-	3	2		1	
CO2	3	3	2	1	1	2	1	1	2	1	-	3	3	2	2	
CO3	3	3	2	2	2	2	1	1	2	2	-	3	3	2	2	
S.No.								Progr	am Ti	tle						
1	Wr	ite a pr	ogram	to imp	lement	an in-	order t	raversa	l of a t	oinary tr	ee and p	rint the n	odes.			

Write a program to implement a pre-order traversal of a binary tree and print the nodes.

Write a program to implement a post-order traversal of a binary tree and print the nodes.

Write a program to count number of nodes in a binary tree

Write a program to check if the Binary tree is balanced or not.

Write a Program to search a number in Binary Search Tree (BST)

Write a program to find the height of the tree

	25	25	50						
	CIE PS	PE (If mentioned in curriculum)	Total						
		Mode of Evaluation							
		Total	l Hours: 30 hrs						
30	Write a program to implement ir	sertion and search operations in a Trie.							
29	Write a program to implement sum of subset problem using backtracking.								
28	Write a program to implement Longest common subsequence (LCS).								
27	Write a program to implement Bellman ford Algorithm.								
26	Write a program to implement Floyd Warshall's all pair shortest path algorithm.								
25	Write a program to implement Kruskal Algorithm.								
24	Write a program to implement Prims Algorithm.								
23	Write a program to implement Dijkstra Algorithm.								
22	Write a program to count the number of connected components in an undirected graph.								
21	Write a program to find the degree of each vertex in an undirected graph.								
20	Write a program to detect a cycle in a directed graph using DFS.								
19	Write a program to detect a cycle in an undirected graph using DFS.								
18	Write a program to find all the vertices reachable from a given vertex in a graph using BFS.								
17	Write a program to check if there	e is a path between two nodes in a graph using DFS.							
16	Write a program to perform Brea	ndth-First Search (BFS) on a graph.							
15	Write a program to perform Dep	th-First Search (DFS) on a graph.							
14	Write a program to create a grap	h using an adjacency list.							
13	Write a program to create a graph using an adjacency matrix.								
12	Write a program to implement priority queue using max heap.								
11	Write a Program to implement human coding algorithm								
10	Write a program to implement a max-heap and perform heap sort on an array of integers.								
9	Write a program to delete a node from a Binary Search Tree (BST).								
8	Write a program to insert a node	in a Binary Search Tree (BST).							



# NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BCSE0455	Course Name: Web Technologies	L	T	P	C
Course Offered in:		0	0	6	3
CSE/CS/IT/CSE(AI)/CSE(AIML)/C					
int					

#### **Pre-requisite:**

- 1. Basic Programming Knowledge
- 2. Knowledge of any programming language (e.g., C, C++, Python/Java)
- 3. Familiarity with basic concepts of Internet.

### **Course Objectives:**

This course covers different aspect of web technology such as HTML, CSS, Java Script and provide fundamental concepts of Internet, Web Technology and Web Programming. Students will be able to build a proper responsive website.

**Course Outcome:** After completion of the course, the student will be able to

S.No	Course Outcome	
CO 1	Identify the basic facts and explaining the basic ideas of Web technology and internet.	
CO2	Applying and creating various HTML5 semantic elements and application with working on HTML forms for	us
CO 3	Understanding and applying the concepts of Creating Style Sheet CSS3 and bootstrap.	
CO 4	Analysing and implementing concept of JavaScript and its applications.	
CO 5	Creating and evaluating dynamic web pages using the concept of PHP.	

#### CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO- PO Map ping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO11	PS O1	PS O2	PS O3
CO1	3	3	2	-	2	-	-	-	2	2	-	3	2	1
CO2	3	2	3	2	3	-	-	-	2	1	2	3	3	2
CO3	3	2	3	-	3	-	-	-	2	2	2	3	2	2
CO4	3	3	3	2	3	-	1	-	2	2	2	2	2	1
CO5	3	3	3	2	3	-	-	-	2	2	2	3	3	3

#### **Course Contents / Syllabus**

Unit 1	Basics of Web Technology & Testing	10
		hours

Introduction: Introduction to Web Technology, History of Web and Internet, Connecting to Internet, Introduction to Internet services and tools, Client-Server Computing, Protocols Governing Web, Basic principles involved in developing a web site, Planning process, Types of Websites, Web Standards and W3C recommendations.

Web Hosting: Web Hosting Basics, Types of Hosting Packages, Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website.

Unit 2 Introduction to HTML & XML 14 hours

HTML: What is HTML, DOM- Introduction to Document Object Model, Basic structure of an HTML document, Mark up Tags, Heading-Paragraphs , Line Breaks, Understand the structure of HTML tables. Lists, Working with Hyperlinks, Image Handling, Understanding Frames and their needs, HTML forms for User inputs. New form Elements- date, number, range, email, search and data list, Understanding audio, video and article tags.

XML: Introduction, Tree, Syntax, Elements, Attributes, Namespaces, Display, HTTP request, Parser, DOM, XPath, XSLT, XQuerry, XLink, Validator, DTD, Schema, Server.

Unit 3	Concepts of CSS3 & Bootstrap	16
		hours

Concept of CSS 3: Creating Style Sheet, CSS Properties , CSS Styling(Background, Text Format, Controlling Fonts) , Working with block elements and objects , Working with Lists and Tables , CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color, Creating page Layout and Site.

Bootstrap: Introduction, Bootstrap grid system, Bootstrap Components.

Unit 4	JavaScript and ES6	16
		hours

JavaScript Essentials: Introduction to Java Script , Javascript Types , Var, Let and Const Keywords, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes , JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions , Using Java Script in Real time , Validation of Forms, Arrow functions and default arguments, Template Strings, Strings methods, Callback functions, Object de-structuring, Spread and Rest Operator, Typescript fundamentals, Typescript OOPs- Classes, Interfaces, Constructor etc. Decorator and Spread Operator

Difference == & ===, Asynchronous Programming in ES6, Promise Constructor, Promise with Chain, Promise Race.

Unit 5	JavaScript and ES6	16
		hours

Introduction to PHP, Basic Syntax, Variables & Constants, Data Type, Operator & Expressions, Control flow and Decision making statements, Functions, Strings, Arrays.

Working with files and directories: Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading. Session & Cookies: Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

		Total Lecture Ho	ours	72 hours
Textbo	ok:			
S.No.	Book Details			
1	C Xavier, "Web Technology and Design", 1nd Edition 2003, New Ag	e International.		
2	Raj Kamal, "Internet and Web Technologies", 2nd Edition 2017,Mc G	raw Hill Educatio	n.	
3	Oluwafemi Alofe, "Beginning PHP Laravel",2nd Edition 2020, kindle	Publication.		
Referen	nce Books:			
1	Burdman, Jessica, "Collaborative Web Development" 5th Edition 199	99, Addison Wesle	y Pul	olication.
2	Randy Connolly, "Fundamentals of Web Development",3rd Edition 2	2016		
3	Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", 4th Edition	on 2010 BPB Publ	icatio	n
NPTEL	/ Youtube/ Faculty Video Link:			
Unit 1	https://youtu.be/96xF9phMsWA https://youtu.be/Zopo5C79m2k https://youtu.be/ZliIs7jHi1s https://youtu.be/htbY9-yggB0			
Unit 2	https://youtu.be/vHmUVQKXIVo https://youtu.be/qz0aGYrrlhU https://youtu.be/BsDoLVMnmZs https://youtu.be/a8W952NBZUE			
Unit 3	https://youtu.be/1Rs2ND1ryYc https://youtu.be/vpAJ0s5S2t0 https://youtu.be/GBOK1-nvdU4 https://youtu.be/Eu7G0jV0ImY			
Unit 4	https://youtu.be/-qfEOE4vtxE https://youtu.be/PkZNo7MFNFg https://youtu.be/W6NZfCO5SIk https://youtu.be/DqaTKBU9TZk			
Unit 5	https://youtu.be/_GMEqhUyyFM https://youtu.be/ImtZ5yENzgE https://youtu.be/xIApzP4mWyA https://youtu.be/qKR5V9rdht0			
Mode of	f Evaluation			
	CIE	ESE		

ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
30			2	20		100		

Sr. No.	Program Title
1	A.Overview and Installation of various code editors.
2	B. Overview and Installation of various servers
3	Implementing HTML program that represent in the document as a start tag, which gives the name and attributes
4	Implementing HTML program that represents a document
5	Implementing HTML program to display your simple CV
6	Creating html document that represents document object model
7	To Create a table to show your class time table.
8	Apply various colors to suitably distinguish keywords, also apply font styling like italics, underline and two other fonts to words you find appropriate, also use header tags.
9	Create a webpage with HTML describing your department use paragraph and list tags
10	Implementing HTML program that for Heading
11	Implementing program that implement paragraph and line-break
12	Use tables to provide layout to your HTML page describing your college infrastructure.
13	Use <span> and <div> tags to provide a layout to the above page instead of a table layout</div></span>

Create links on the words e.g. —Wi-Fi and —LAN to link them to Wikipedia pages

Insert an image and create a link such that clicking on image takes user to other page

Creating a XML document that defines the self-descriptive tags

Change the background color of the page; At the bottom create a link to take user to the top of the

Creating HTML program to implement three articles with independent, self-contained content.

Designing XML document that store various book data such as: book category, title, author, year

14

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page.

and price

20	To Describe the various types of XML key components
21	Design XML DTD to define the structure and legal element and attribute of XML document
22	To implement internal and external DTD
23	Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
24	Design a HTML registration form that takes user name, user password and mobile number with submit button control
25	Design a HTML5 document that implement of date, number, range, email, search and data list.
26	Implementation in HTML5 that include native audio and video support without the need for Flash.
27	Create a simple form to submit user input like his name, age, address and favourite subject, movie and singer.
28	Add few form elements such as radio buttons, check boxes and password field. Add a submit button at last.
29	Add CSS property assign a style or behavior to an HTML element such as: color, border, margin and font-style.
30	Add To Style Text Elements with Font, Size, and Color in CSS
31	Applying a block element in CSS acquires up the full width available for that content.
32	Demonstrating the CSS Box model with consists of: borders, padding, margins, and the actual content.
33	Design a web page by applying CSS grouping and dimensions property.
34	Design a XML Schema that describes the structure of an XML document.
35	Design a XML document that describe the well-formed XML document
36	Design a XML document of CD Catalog through each <cd> element, and displays the values of the <artist> and the <title> elements in an HTML table&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;37&lt;/td&gt;&lt;td&gt;Create a XSL document for and taken xml document by you.&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;38&lt;/td&gt;&lt;td&gt;Create a XSLT document for and taken xml document by you with all steps&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;39&lt;/td&gt;&lt;td&gt;Design a web page by applying CSS Display and Positioning property.&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;40&lt;/td&gt;&lt;td&gt;Design a web page by applying CSS Display and Positioning property .&lt;/td&gt;&lt;/tr&gt;&lt;/tbody&gt;&lt;/table&gt;</title></artist></cd>

41	Design a web page by applying CSS pseudo classes.
42	Creating a Java Script code to implement all data types.
43	Design a basic structure of Bootstrap Grid system.
44	Design All Bootstrap Components with example.
45	Implementing a program in Java script to implement augmented function.
46	Implementing a program to implement calculator application as real time.
47	Design a HTML form validation using Java Script.
48	Write a program to implement Arrow function with default argument in ES6
49	Implementing a program in ES6 to implement Template string concepts
50	Implementing a program in ES6 to implement all string methods.
51	Creating a Java Script program to implement Dialog, Confirm and Message Popup Boxes.
52	Implementing a Java Script program to implement onClick and onSubmit event
53	Creating a java script code to implement 'let' keyword
54	Creating a java script code to implement 'const' keyword
55	Implementing a program to implement call back functions in ES6.
56	Implementing a program for de-structuring of an array in ES6
57	Javascript code to implement object and class concepts in Typescript.
58	Write a Typescript program that implement interface and constructor
59	Write a code in typescript that implement decorator and spread operator
60	Create a constant by using define() function with its proper syntax
61	Creating PHP script that return any data types whatever you use.
62	Implementing a code in Java Script to implement Spread and rest operator
63	Javascript code that should compile by Typescript compiler as'tsc'
64	Write a code in typescript that implement Asynchronous Programming concepts.
65	Write a program in Typescript that implement promise constructor

66	Implementing promise and chain concepts in Typescript
67	Write a code in typescript that implement Promise.race() static method.
68	Crating a program that implement control flow and decision making statement.
69	Creating PHP to implements parameterized function
70	Creating program in PHP to store multiple string and concatenate these string and print it.
71	Write a PHP script to create and delete directory structure
72	Program to upload and download a file in PHP
73	Implements single dimension array in PHP
74	Write a PHP code to open and close a file in a proper manner
75	Write a PHP script to copying, renaming and deleting a file.
76	PHP program to create and destroy a session.
77	PHP program to set and delete a cookie.
78	PHP program to manually register the session variable
79	PHP program to manually destroy the session variable
80	PHP program to store the session data on one page and would be available on second page.



## NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

## (An Autonomous Institute) School of Computer Science in Emerging Technology

LAB Course Code: BCSCC0452	LAB Course Name: Problem Solving Approaches	L	T	P	С
Course Offered in:		0	0	2	1

**Pre-requisite:** Programming Language C/C++ or Java or Python

#### **Course Objectives:**

Problem-solving in computer programming involves a structured approach to identifying, analyzing, and resolving coding challenges. The process typically includes thoroughly understanding the problem, decomposing it into smaller, manageable parts, designing an appropriate algorithm, implementing the solution through code, and performing testing and debugging to ensure correctness and efficiency

Course Outcome: After completion of the	e course, the student will be able to	Bloom's
		Knowledg
		e Level
		(KL)
CO1	Develop logic-based solutions using control statements, recursion and bit manipulation to solve basic and intermediate computational problems.	K6
CO2	Implement and manipulate arrays and strings using fundamental and advanced searching sorting techniques.	К3
CO3	Analyze and debug code for logical errors and improve the efficiency of the solution using appropriate data structures and algorithmic patterns.	K4

**CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)** 

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	2	2	-	-	2	3	2	2
CO2	3	3	2	2	2	-	2	-	-	-	2	3	2	1
CO3	3	3	2	2	3	1	2	2	-	-	3	3	2	3

#### **List Of Practical's (Indicative & Not Limited To)**

#### Problem Statements need to be discussed in lab session: Control Statements

#### 1. Secure Password Generator

A company wants to create a secure password generator for their employees. The password must be based on specific numeric properties to enhance its complexity and security. Write a program to validate and generate a secure password according to the following rules:

#### 1. Prime Number Validation:

- The user must input a 3-digit number. The program should first check if the number is a prime number.
- If it is not a prime number, the user should be prompted to enter another number until a valid prime number is provided.

#### 2. Sum of Digits Check:

• Once a valid prime number is entered, calculate the sum of its digits. If the sum of the digits is not divisible by 3, ask the user to enter another prime number until a valid one is found.

#### 3. Armstrong Number Check:

• Check entered prime number is Armstrong or not? If Armstrong are found, prompt the user to enter another prime number and repeat the process.

#### **Password Generation:**

Concatenate the 1 if entered prime number is Armstrong otherwise 2 with the sum of the digits of the valid prime number to form the secure password.

#### **Example Scenario:**

#### Sample Input

Enter a 3-digit prime number: 153

Sum of digits of 153 = 9

The sum is divisible by 3.

153 is Armstrong number

#### Sample Output

Secure Password:19

2. Write a function to input electricity unit charges and calculate total electricity bill according to the given condition:

For first 50 units Rs. 0.50/unit

For next 100 units Rs. 0.75/unit

For next 100 units Rs. 1.20/unit

For unit above 250 Rs. 1.50/unit

An additional surcharge of 20% is added to the bill

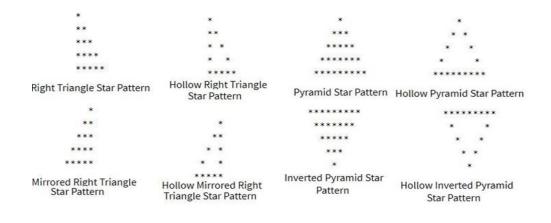
**3.** Write a method to generate a secure code which the sum of all possible palindrome numbers between given two numbers.

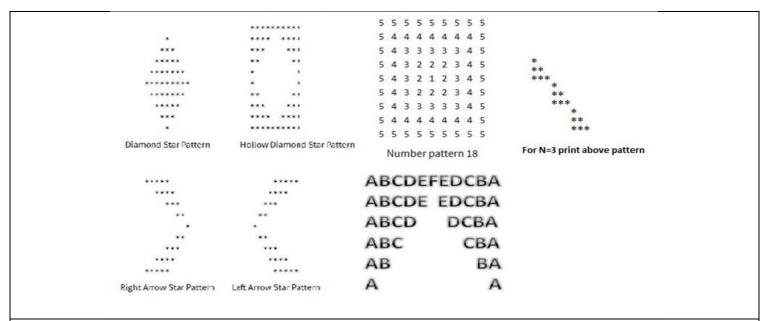
For Example: Input: 10, 80 Output: 308

**Explanation**: All palindrome numbers between 10 & 80 are: 11,22,33,44,55,66,77

Password= 11+22+33+44+55+66+77 = 308

#### 4. Draw the following Patterns for N=5





#### **Problem Statements need to be discussed in lab session:** Recursive Approach (Basic)

- 1. Write a program that takes an integer n as input and prints the multiplication table of n from n \* 1 to n \* 10. The output should clearly show each multiplication step.
- **2.** Write a program to calculate the sum of all integers from 1 to a given number N. The program should take N as input and output the total sum using iteration or recursion.

#### 3. Find the GCD of Two Numbers Using Recursion:

Write a recursive function to calculate the Greatest Common Divisor (GCD) of two numbers using Euclid's algorithm. The function should take two integers as input and return their GCD.

#### 4. Find the LCM of Two Numbers Using Recursion:

Write a program to compute the Least Common Multiple (LCM) of two numbers using recursion. You may use the relationship LCM(a, b) = |a \* b| / GCD(a, b) and a recursive function for GCD.

#### Problem Statements need to be discussed in lab session: Bit Manipulation

- 1. Write a program to count the number of set bits (1s) in the binary representation of a given integer. The program should efficiently use bitwise operations to perform the task without converting the number to a string.
- 2. Write a program that takes a number and a bit position as input and checks whether the bit at that position is set (1) or clear (0). Use bitwise operators to perform the check
- **3.** Given a number and a position, write a program to toggle (invert) the bit at the given position using bitwise operations. The result should reflect the updated value of the number after flipping the bit.
- **4.** Write a program to compute the XOR of all numbers from 1 to n using a mathematical pattern (not a loop). Use bitwise XOR properties to achieve an efficient solution.

- **5.** Given an array of size n-1 containing unique elements from 1 to n, find the missing number using bit manipulation (preferably XOR approach) without sorting or using extra space.
- **6.** Given an array where all elements repeat twice except two elements that appear only once, write a program to find the two non-repeating elements using bitwise operations in linear time and constant space.
- 7. Write a program to check if a given number is a power of two using bit manipulation. A number is a power of two if it has exactly one set bit in its binary representation.
- **8.** Given two integers A and B, write a program to count how many bits need to be flipped to convert A to B. Use XOR to find differing bits and count the number of set bits.
- **9.** Write an efficient program to count the total number of set bits in binary representations of all numbers from 1 to n. Optimize the approach using bitwise logic and recursion.
- **10.** Write a program to calculate the square of a number using only bitwise operations and addition. Do not use multiplication, division, or any power functions.
- **11.** Write a function to add two integers using bitwise operations only. Avoid using the + or operators. Implement logic using XOR and AND operations for binary addition.
- **12.** Write a program to generate the power set (all subsets) of a given set using bitwise representation. Each subset can be represented by a binary number where each bit indicates inclusion of the corresponding element.

**Problem Statements need to be discussed in lab session:** Arrays (Try to use sliding window, prefix sum, cadence, recursion, bit manipulation, two pointer approaches)

1. Sarah is assisting the "MathMinds Club" in creating passwords for their online platform. They have a list of numbers, some stable and some unstable. Define a function that can help Sarah calculate the password according to the given scenario.

#### Scenario:

- There are N numbers provided.
- A number is stable if each digit appears the same number of times.
- A number is unstable if the frequency of its digits is not the same.
- The password is computed as the sum of all stable numbers minus the sum of all unstable numbers.
- Consider only those numbers in the list that have more than equal to three digits.

For example:

Input: N=5 List: 12, 1313, 122, 678, 898

Output: Password: 971

2. Given an array of integers, including possible negative values, you are allowed to modify at most one element by doubling its value. The goal is to find the maximum possible sum of any subarray after making this modification.

#### **Input**:

$$arr = [-2, 1, -3, 4, -1, 2, 1, -5, 4]$$

**Expected Output:** 

- Original Maximum Subarray Sum: 6 (achieved from [4, -1, 2, 1])
- Maximum Sum After Modification: 10(achieved from [8, -1, 2, 1], where the value 4 is doubled to 8).
- 3. For a given string, generate a pattern based on the following rules:

**Input:** A string of characters (e.g., "HAT").

Output: Generate patterns by replacing characters with the numeric value 1 and process the patterns as described below:

- 1. Replace one character at a time with 1:
  - o For each character in the string, replace it with 1, keeping the other characters unchanged.
  - Example for "HAT":1AT, H1T, HA1
- 2. Replace two characters at a time with 1:
  - Replace every combination of two characters with 1, keeping the remaining character unchanged.
  - o If 1s are consecutive, replace them with their sum (e.g., 11T becomes 2T).
  - Example for "HAT":  $11T \rightarrow 2T$ ,  $H11 \rightarrow H2$ , 1A1
- 3. Replace all characters with 1:
  - o Replace all characters in the string with 1.
  - o If there are consecutive 1s, sum them up (e.g., 111 becomes 3).
  - Example for "HAT":  $111 \rightarrow 3$

#### Final Output

For the string "HAT", the output should be:

1AT, H1T, HA1, 2T, H2, 1A1, 3.

**4.** Given a sorted array arr [] and a target value, the task is to count triplets (i, j, k) of valid indices, such that arr[i] + arr[j] + arr[k] = target and i < j < k.

#### **Examples**:

Input: 
$$arr[] = [-3, -1, -1, 0, 1, 2], target = -2$$

Output: 4

- **5.** You are given an array prices[] where prices[i] represents the price of a given stock on day i. You want to maximize your profit by choosing a single day to buy one stock and choosing a different day in the future to sell that stock. Write a program to return the maximum profit you can achieve from this transaction. If no profit is possible, return 0.
- 6. Find the "Kth" max and min element of an array:

Given k, find the k-th smallest and k-th largest element in the array.

Input: arr = [7, 10, 4, 3, 20, 15], k = 3 Output: Kth Smallest: 7, Kth Largest: 10 7. Sort a binary array with values 0, 1, and 2 using constant space and one pass (Dutch National Flag algorithm).

**Input:**[0, 2, 1, 2, 0] **Output:**[0, 0, 1, 2, 2]

**8.** Find longest consecutive subsequence:

Return the length of the longest consecutive elements sequence.

Input: [1, 9, 3, 10, 4, 20, 2] Output: 4 (Sequence: 1, 2, 3, 4)

**9.** Given a number of bits and a number K. In one flip you can toggle exactly K consecutive bits. With only this flip operation available, convert the string into all 1.

Input String: 0000110000 and K=3

Following are four flip operations by using which all bits converted into 1's.

Flip1-1110110000 Flip2- 1110110111 Flip3-1111000111 Flip4- 111111111

If it is not possible to convert all bits into one's then print "IMPOSSIBLE".

10. Given a list of non-negative integers, arrange them in such a way that they form the largest possible number. Since the result can be very large, return it as a string in  $O(N \log N)$  time complexity.

Example-1	Example-2
Input: N = 5 Arr[] = {3, 30, 34, 5, 9} Output: 9534330	Input: N = 4 Arr[] = {54, 546, 548, 60} Output: 6054854654

11. Given an array arr[] of size n containing distinct integers within the range [1, n+2], find the two missing numbers from the first n+2 natural numbers.

#### **Constraints:**

- The solution must run in O(N) time and use O(1) extra space.
- The array does not contain duplicate values.

**Examples:** 

**Input:** arr[] = [1, 2, 4, 6, 3, 8], n = 6

**Output:** 5, 7

**12.** Given a string str of lowercase alphabets and a number k, the task is to print the minimum value of the string after removal of k characters. The value of a string is defined as the sum of squares of the count of each distinct character present in the string. Return the minimum possible required value. **Examples:** 

**Input:** str = "abccc", k = 1

Output: 6

Input: str = "aabcbcbcabcc", k = 3

Output: 27

**Expected Time Complexity:** O(n+klog(p))

**Note**: Here n is the length of string and p is number of distinct alphabets and k number of alphabets to be removed.

**13.** Given a non-negative integer **S** represented as a string, remove **K** digits from the number so that the new number is the smallest possible.

**Note:** The given *num* does not contain any leading zero.

**Expected Time Complexity:** O(|S|).

Example 1:	Example 2:
Input:	<b>Input</b> : S = "1002991", K = 3
S = "149811", K = 3	Output: 21
Output:	

**14.** You are given a two-dimensional grid board[][] of size n \* m consisting of English letters and a string target. Your task is to determine whether the target word can be formed by sequentially connecting letters from the grid. You may move to adjacent cells **horizontally or vertically** (not diagonally), and **a cell may not be reused** once it is part of the current path.

#### **Examples:**

#### **Input:**

board[][] = [['C', 'A', 'T'], ['R', 'A', 'K'], ['T', 'O', 'N']],

target = "CART"

### Output: true Explanation:

You can trace the word "CART" through the path:  $C \to A \to R \to T$  (moving horizontally and vertically, without repeating cells).

- 15. Given an encoded string s, the task is to decode it. The encoding rule is:
- **k[encodedString]**, where the **encodedString** inside the square brackets is being repeated exactly **k** times. Note that **k** is guaranteed to be a positive integer, and encodedString contains only lowercase english alphabets. **Note:** The test cases are generated so that the length of the output string will never exceed 10^5.

**Examples:** 

**Input:** s = "1[b]" **Output:** "b"

**Input:** s = "3[b2[ca]]" **Output:** "beacabeacabeaca"

\*Competitive coding list will be shared with the students.

Total	<b>Hours:</b>	30	hrc
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<b>Mode of Evaluation</b>				
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PS1	PS2	PS3	(If mentioned	
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# NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

**School of Computer Science in Emerging Technologies** 

Course	Cod	e: BN(	C0401Y	Y		(	Course N	ame: A	Artificia	al Intellg	gence and	d Cyber E	thics	L	Т	P	С
Course	Course Offered in: B. Tech.							2	0	0	2						
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	and ensure students can identify, analyze, and address ethical dilemmas in Artificial Intelligence and cyber domains.  Course Outcome: After completion of the course, the student will be able to  Bloom's Knowledge									ledge							
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CO2		2	3	2		2	1	2		2	1	2	2	1	1		
CO3		2	3	2	1	2	3	3		2	2	2	2	2	1		
CO4		2	2			1	3	3		2	2	2	2	1	1		
Course	Con	tents /	Syllab	us													
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Reference	ce Books:											
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	Panda, Cengage India, 2022.											
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