Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF COMPUTER SCIENCE & ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SCHEME & SYLLABUS BOOKLET

B.Tech. BATCH 2023-2027

B. TECH AI & DS

SCHEME & SYLLABUS

BATCH: 2023–27

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Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Student Details

Name of Student:

Name of Program:

Semester: Year: Batch:

Faculty of:

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POORNIMA UNIVERSITY

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VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor to face global competitive challenges.

Mission

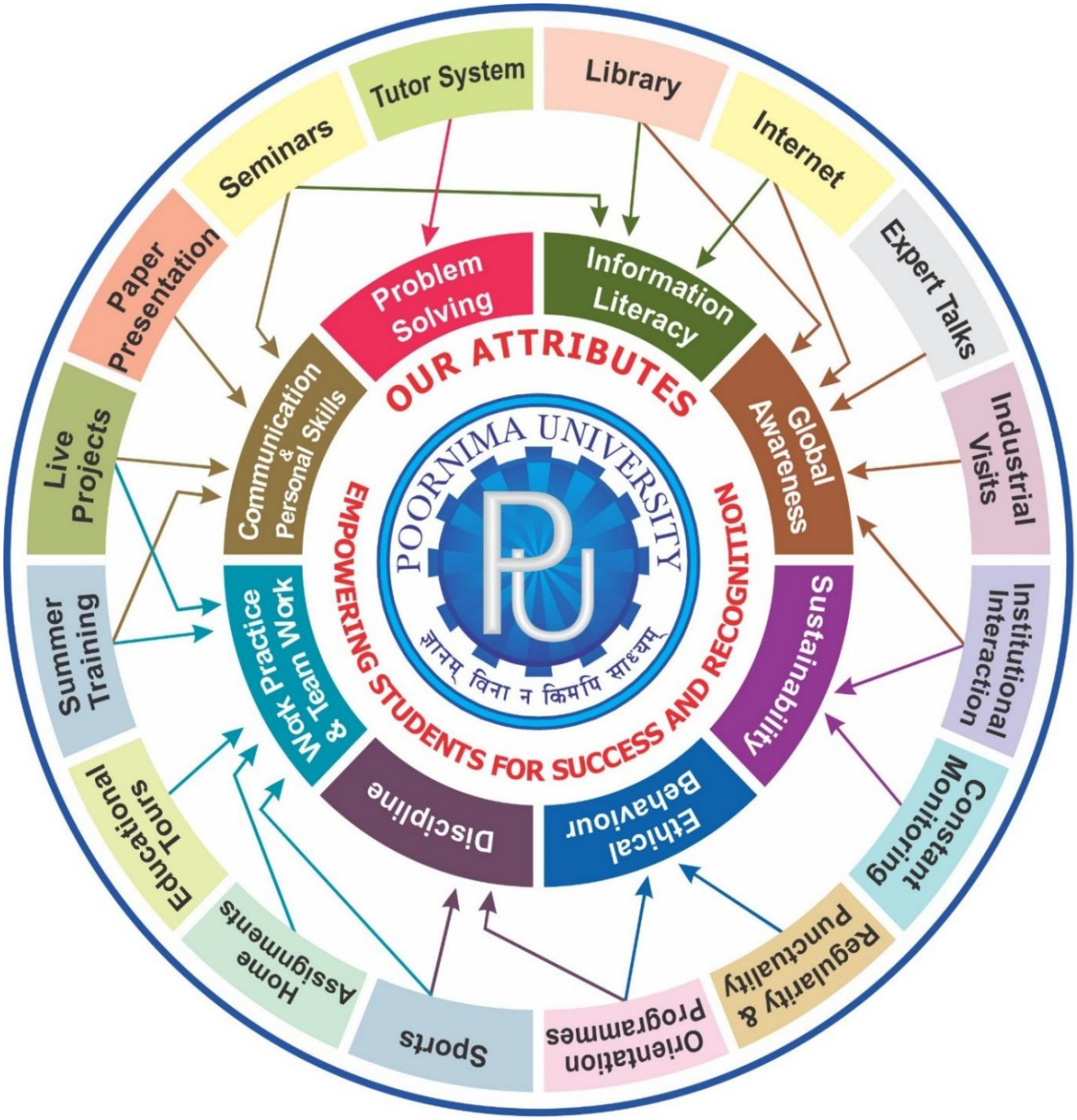
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide Quality Education through Faculty development, updating of facilities and continual improvement meeting University norms and keeping stake holders satisfied.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.



About Program and Program Outcomes (PO):

Title of the Programme: Bachelor of Technology (B. Tech.)

Nature of the Programme: B. Tech. is four year full-time programme.

Program Outcomes (PO) :

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

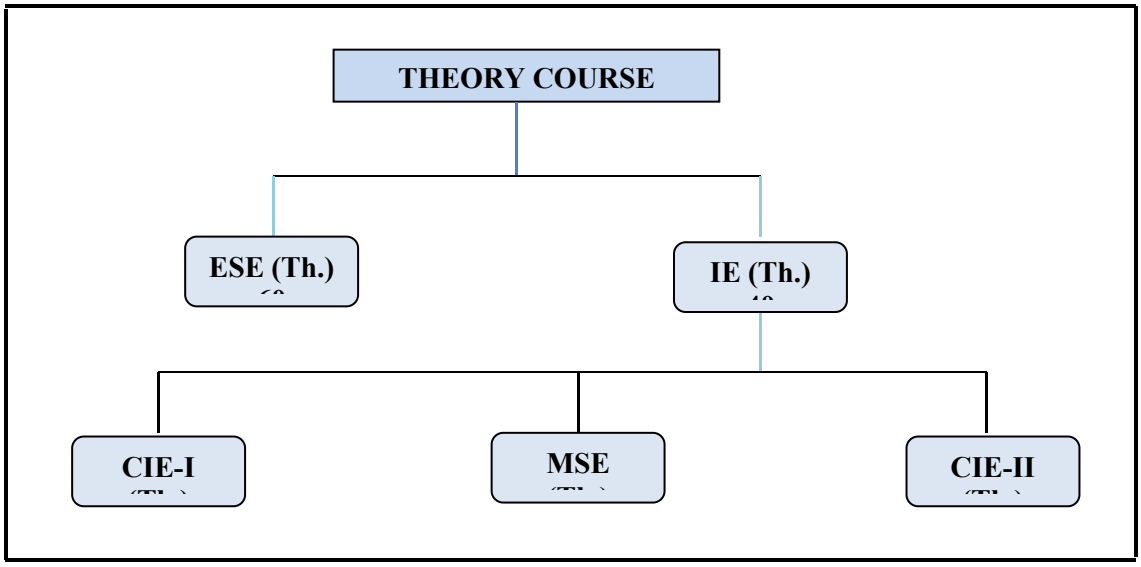
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

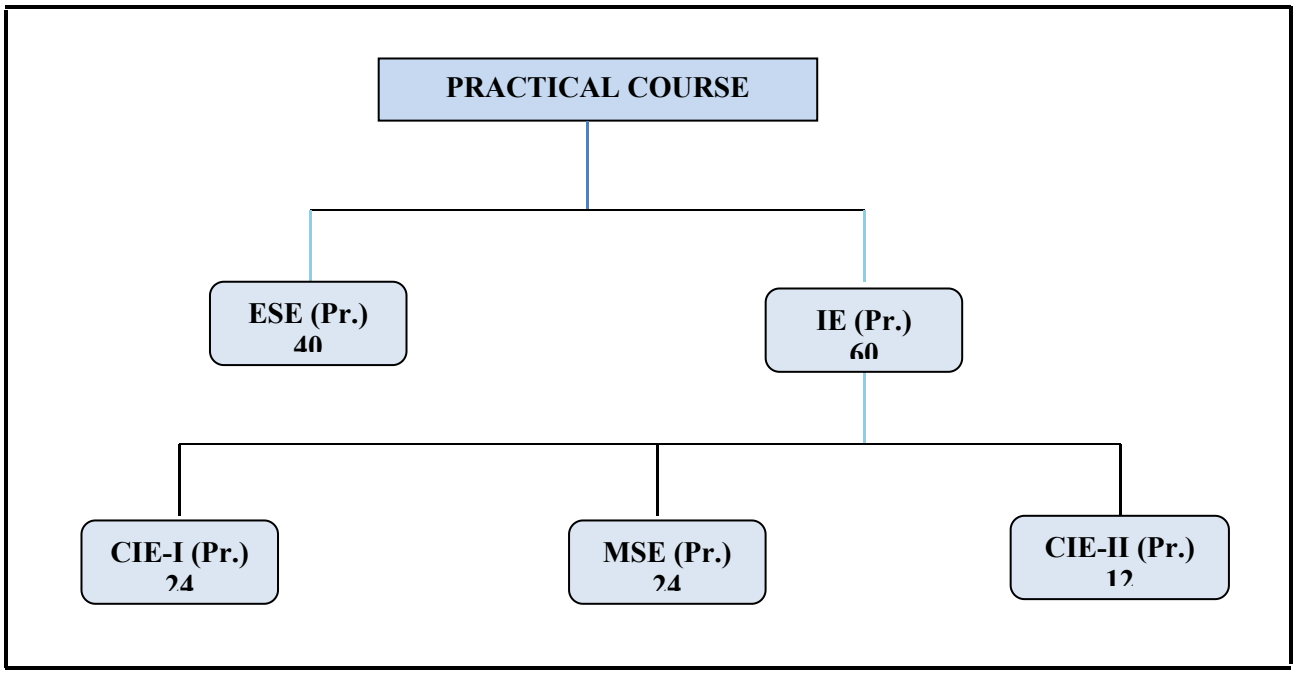
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Examination System :

A. Marks Distribution of Theory Course:



B. Marks Distribution of Practical Course :



Th.: Theory, Pr.: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

CO Wise Marks Distribution:

Exam Entity	Theory Subject		Practical/ Studio Subject	
	Maximum Marks	CO to be Covered	CO to be Covered	Maximum Marks
CIE-I	16 (8 + 8)	1 & 2	1 & 2	24 (12 + 12)
MSE	16 (8 + 8)	3 & 4	3 & 4	24 (12 + 12)
CIE-II (Activity/ Assignment)	8 (8)	5	5	12 (12)
ESE	60	-	-	40
TOTAL	100	-	-	100

Minimum Passing Percentage in All Exams:

S No.	Program Name	Minimum Passing Percentage in		
		IE Component	ESE Component	Total Component
1	Course Work for PhD Registration	**-**	**-**	**50%**
2	B. Arch.	**-**	**45%**	**50%**
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	**-**	**40%**	**40%**
4	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	**-**	**35%**	**35%**

SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

C_i is the number of credits of subject i,

G_i is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

Grading Table:

Applicable for B.Arch. & Ph.D. Courses

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Fail	F	0	x <50
Absent	Ab	0	Absent

Applicable for All Courses except B.Arch. & Ph.D.

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Average	C	5	40≤ x <50
Pass	P	4	35≤ x <40
Fail	F	0	x <35
Absent	Ab	0	Absent

CGPA to percentage conversion rule:

Equivalent%ofMarksintheProgram=*CGPA10**

Award of Class

CGPA	Percentage	Equivalent Division
7.50 ≤ CGPA	75% or more	First Division with Distinction
6.00 ≤ CGPA < 7.50	60% ≤ x <75%	First Division
5.00 ≤ CGPA < 6.00	50% ≤ x <60%	Second Division
4.00 ≤ CGPA < 5.00	40% ≤ x < 50%	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2023-24)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM and NPTEL.

1. Introduction of MOOCs: SWAYAM and NPTEL

About SWAYAM:

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through a platform that facilitates hosting of all the courses, taught in classrooms to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. However learners wanting a SWAYAM certificate should register for the final proctored exams that come at a fee and attend in-person at designated centers on specified dates. Eligibility for the certificate will be announced on the course page and learners will get certificates only if this criteria is matched.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.

In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

1. AICTE (All India Council for Technical Education) for self-paced and international courses
2. NPTEL (National Programme on Technology Enhanced Learning) for Engineering
3. UGC (University Grants Commission) for non-technical post-graduation education
4. CEC (Consortium for Educational Communication) for under-graduate education
5. NCERT (National Council of Educational Research and Training) for school education
6. NIOS (National Institute of Open Schooling) for school education
7. IGNOU (Indira Gandhi National Open University) for out-of-school students
8. IIMB (Indian Institute of Management, Bangalore) for management studies
9. NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

Two types of courses are offered on SWAYAM platform: Credit Courses and Non- Credit Courses. Credit courses are offered for each semester in January and July every year. The list is available on SWAYAM official website: https://onlinecourses.swayam2.ac.in/

About NPTEL:

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management

subjects

- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers
- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.
Some statistics regarding the open online courses since March 2014 till Dec 2021
Completed courses: 3496;
Enrollments across courses: 1.58 CRORE +
Number of exam registrations: 15.1 LAKH +
All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses.
All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

(a) Options for MOOCs at Poornima University

(For this document, only those MOOCs will be considered which are available on SWAYAM & NPTEL platforms)

- Credit and Non-credit SWAYAM MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- In case of credit courses, there are two ways to opt these courses for the purpose of credit transfer to PU system as given below:

OPTION–I: As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards):

Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards) are available at University level in offline mode for which relevant booklets are already published. **These courses carries 02 credits.** These category/type of courses (similar/different) are also available as MOOC courses. The respective Deans / HODs shall provide both the options to all the students to either select offline courses or MOOCs as per details given below:

- Deans / HODs shall prepare a list of upto 05 appropriate MOOC courses of 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits **(only 02)** of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
- If the students are not willing to opt for MOOC Open Elective/ Multidisciplinary course, they can proceed with the current

offline practice of opting for Multidisciplinary courses.

- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.

OR

OPTION–II: As Major / Minor Courses:

- Deans / HODs shall identify a course of **03 credits** for each semester, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students citing that the particular course will be conducted through MOOCs only and is compulsory for all respective students. The credits of this course will be counted against Major/Minor courses pertaining to that particular semester.
- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.
- This is to be noted that if Deans / HODs decide to conduct any major/minor course in any semester through MOOCs, no offline course will be conducted against that.

(b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- Last period of T/T/S shall be taken for MOOC courses which shall be in self-study mode.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no exam will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- SWAYAM will award a certificate to all the students passing the examination along with the credit earned. The center of examination for SWAYAM MOOCs will be finalized by SWAYAM. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.
- Any student who would not be able to register/present/clear/pass the MOOC in the stipulated time, it is the choice of the student that he or she may register in next semester (odd or even) with MOOC again or appear as a back exam candidate of the University as per PU norms.
- There will be no provision of re-evaluation of MOOC.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.

NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.

Attached Items:

Open Elective Booklet	Annexure-1
Soft Skills Booklet	Annexure-2
Value Added Course Booklet	Annexure-3

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Years** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-I

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits	
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BTXCSA1101	Basic Science for Engineers	3	-	-	1*	40	60	100	3
BTXCCE1102	Fundamental of Computer	3	-	-	1*	40	60	100	3
BTXCME1103/ BTXCEE1104	Basics of Civil Engineering / Basics of Electrical and Electronics Engineering	3	-	-	2*	40	60	100	3
BTXCSA1105/ BTXCME1106	Engineering Mathematics / Basic of Mechanical Engineering	3	-	-	2*	40	60	100	3
A.2	**Practical**								
BTXCSA1201	Basic Science lab	-	-	2		60	40	100	1
BTXCCE1202	Programming in C Lab	-	-	2		60	40	100	1
BTXCCV1203/ BTXCEE1204	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	1	2		60	40	100	1
BTXCME1205/ BTXCME1206	Workshop Practice/Engineering Graphics	-	1	2		60	40	100	1
BTXCCE1207	Exploratory Project	-	-	2		60	40	100	1
B.		**Minor Stream Courses/ Department Electives**							
B.1	**Theory**								
B.2	**Practical**								
C		**Multidisciplinary Courses**							
		-	-	-					
D		**Ability Enhancement Courses (AEC)**							
BUACHU1101	English	2	-	-		40	60	100	2
E		**Skill Enhancement Courses (SEC)**							
BULCSE1201	Skill Enhancement Generic Course-I	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCSA1102	Environmental Studies	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
Total		16	2	12	6*				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

- Classes will be conducted fortnightly

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Years** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-II

Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BTXCCE2101	Python	3	-	-	2*	40	60	100	3
BTXCCV2102/ BTXCEE2103	Basic of Civil Engineering / Basics of Electrical and Electronics Engineering	3	-	-	2*	40	60	100	3
BTXCSA2104/ BTXCME2105	Engineering Mathematics / Basic of Mechanical Engineering	3	-	-	2*	40	60	100	3
A.2	**Practical**								
BTXCCE2201	Programming in Python Lab	-	-	2		60	40	100	1
BTXCCV2202/ BTXCEE2203	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	1	2		60	40	100	1
BTXCME2205/ BTXCME2206	Workshop Practice/Engineering Graphics	-	1	2		60	40	100	1
BTXCCE2207	Exploratory Project	-	-	2		60	40	100	1
B.		Minor Stream Courses/**Department Electives**							
B.1	**Theory (Any One)**								
BTXECE2111 BTXECE2112 BTXECE2113 BTXECE2114 BTXECE2115 BTXEME2116	• Introduction to AI&DS • Introduction to Cyber Security • Introduction to Cloud • Introduction to Game Tech. • Digital Electronics • Engineering Mechanics	3	-	-		40	60	100	3
B.2	**Practical**								
C		**Multidisciplinary Courses**							
	MOOC Course-I	2	-	-					2
D		**Ability Enhancement Courses (AEC)**							
BUACHU2204	Language Lab	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE2201	Skill Enhancement Generic Course-II	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCPH2102	Health Behavior in Communication	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
		-	-	-					
Total		16	2	12	6*				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

***Classes will be conducted fortnightly**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Years** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-III

Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BCECCE3101	Introduction to Web Technology	3	-	-	1*	40	60	100	3
BCECCE3102	Data Structures and Algorithms	3	-	-	1*	40	60	100	3
BCECCE3103	Operating System	3	-	-	1*	40	60	100	3
A.2	**Practical**								
BCECCE3201	Web Technology Lab	-	-	2		60	40	100	1
BCECCE3202	Data Structures and Algorithms Lab	-	-	2		60	40	100	1
BCECCE3203	Linux Operating System Lab	-	-	2		60	40	100	1
BCECCE3204	Office Automation Lab	-	-	2		60	40	100	1
B.		Minor Stream Courses/**Department Electives**							
B.1	**Theory**								
BCEECE03111/ BCEECE03112	Software Engineering/SAS Programing in Viya	3	-	-	1*	40	60	100	3
BCEECE03121/ BCEECE03122/ BCEECE03123/ BCEECE03124/ BCEECE03125/ BCEECE03126	Theory Of Computation/Statistical Foundation Of Data Science/Analytics Programming Fundamental/Cyber Criminal Law & IPR/Instalation & Configuration Server/Introduction To UI/UX	3	-	-	1*	40	60	100	3
B.2	**Practical**								
	-								
C		**Multidisciplinary Courses**							
	MOOC Course-II	1	-	-	1*	40	60	100	2
D		**Ability Enhancement Courses (AEC)**							
BUACHU3208	Communication Skills-I	-	-	2		40	60	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE3201	Skill Enhancement Generic Course-III	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCCE3101	Digital Marketing	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
	-	18		12	6*				**25**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

Classes will be conducted fortnightly

POORNIMA UNIVERSITY, JAIPUR
Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Years** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-IV

Course Code	Name of Course	Teaching Scheme			SH	Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)		IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BCECCE4101	Computer Networks	3	-	-	1*	40	60	100	3
BCECCE4102	OOPS With Java	3	-	-	1*	40	60	100	3
BCECCE4103	Relational Database Management System	3	-	-	1*	40	60	100	3
BCECCE4104	Advance Data Structure	3	-	-	1*	40	60	100	3
A.2	**Practical**								
BCECCE4201	Computer Networks Lab	-	-	2		60	40	100	1
BCECCE4202	OOPS With Java Lab	-	-	2		60	40	100	1
BCECCE4203	Relational Database Management System lab	-	-	2		60	40	100	1
	Minor Stream Courses/Department Electives								
B.1	**Theory**								
BADCCE4101	Fundamentals of Machine Learning	3	-	-	1*	40 40	60	100	3
B.2	**Practical**								
BADCCE4201	Fundamentals of Machine Learning Lab	-	-	2		60	40	100	1
C		**Multidisciplinary Courses (MC)**							
	MOOC Course-III	1	-	-	1*	40	60	100	2
D		**Ability Enhancement Courses (AEC)**							
BUACHU4212	Communication Skills-II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE4201	Skill Enhancement Generic Course-IV	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCCE4102	Business Intelligence	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
Total		18	-	12	6*				**25**
Total Teaching Hours		**30/36**							

SH: Supporting Hours
*Classes will be conducted fortnightly

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Years** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-V

Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BCECCE5101	Design & Analysis of Algorithms	3	-	-	1*	40	60	100	3
BCECCE5102	Advance Java	3	-	-	1*	40	60	100	3
BCECCE5103	Information System Security	3	-	-	1*	40	60	100	3
A.2	**Practical**								
BCECCE5201	Design & Analysis of Algorithms Lab	-	-	2		60	40	100	1
BCECCE5202	Advance Java Lab	-	-	2		60	40	100	1
BCECCE5203	Technical Seminar	-	-	2		60	40	100	1
B.		**Minor Stream Courses**/Department Electives							
B.1	**Theory**								
BADCCE5101	RPA Tool	3	-	-	1*	40	60	100	3
BADCCE5102	R Programming	3	-	-	1*	40	60	100	3
B.2	**Practical**								
BADCCE5201	RPA Tool Lab	-	-	2		60	40	100	1
BADCCE5202	R Programming Lab	-	-	2		60	40	100	1
C		**Multidisciplinary Courses**							
	MOOC Course-IV	1	-	-	1*	40	60	100	2
D		**Ability Enhancement Courses (AEC)**							
BUACHU5218	Professional Skills-I	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE5201	Skill Enhancement Generic Course-V	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
		-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
Total		16	-	14	6*				**24**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

- *Classes will be conducted fortnightly

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Year** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-VI

Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	Theory								
BCECCE6101	Big Data Analytics	3	-	-	1*	40	60	100	3
BCECCE6102	Computer Architecture	3	-	-	1*	40	60	100	3
BCECCE6103	SalesForce	3	-	-	1*	40	60	100	3
A.2	Practical								
BCECCE6201	Big Data Analytics Lab	-	-	2		60	40	100	1
BCECCE6202	SalesForce	-	-	2		60	40	100	1
B.		**Minor Stream Courses**/Department Electives							
B.1	Theory								
BADCCE6101	Deep Learning & Computer Vision	3	-	-	1*	40	60	100	3
BADCCE6102	Natural Language Processing	3	-	-	1*	40	60	100	3
B.2	Practical								
BADCCE6201	Deep Learning & Computer Vision Lab	-	-	2		60	40	100	1
BADCCE6202	Natural Language Processing Lab	-	-	2		60	40	100	1
C		**Multidisciplinary Courses**							
	MOOC Course-V	1	-	-	1*	40	60	100	2
D		**Ability Enhancement Courses (AEC)**							
BUACHU6223	Professional Skills-II	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE6201	Skill Enhancement General Courses-VI	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
	-	-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
BCECCE6401	Industrial Training Seminar-I	-	-	2		60	40	100	1
Total		16	-	14	6*				24
Total Teaching Hours		**30/36**							

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS Duration: 4 Years Total Credits: 171

Teaching Scheme for Batch 2023-27

		Semester-VII							
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BCECCE7101	Data Mining Techniques and Applications	3	-	-	1*	40	60	100	3
A.2	**Practical**								
BCECCE7201	Data Mining Techniques and Application Lab	-	-	2		60	40	100	1
BCECCE7202	Internet of Things (IoT) Lab	-	-	2		60	40	100	1
B.		**Minor Stream Courses**/Department Electives							
B.1	**Theory**								
BADCCE7101	Python for Time Series Data Analysis	3	-	-	1*	40	60	100	3
BADCCE7102	Data Handling & Visualization	3	-	-	1*	40	60	100	3
B.2	**Practical**								
BADCCE7201	Python for Time Series Data Analysis Lab	-	-	2		60	40	100	1
BADCCE7202	Data Handling & Visualization lab	-	-	2		60	40	100	1
C		**Multidisciplinary Courses**							
	NIL								
D		**Ability Enhancement Courses (AEC)**							
BUACHU7226	Comparative Literature Lab	-	-	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE7201	Skill Enhancement Technical Courses-I	2	-	-		40	60	100	2
F		**Value Added Courses (VAC)**							
	-	-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
BCECCE7301	Minor Project	-	-	4		60	40	100	2
BCECCE7401	Industrial Training Seminar-II			2		60	40	100	1
Total		11	-	16	3*				**19**
Total Teaching Hours		**27 / 30**							

SH: Supporting Hours

- Classes will be conducted fortnight on I,III and IV Monday

TO balance Discipline Credit or Remaining Hours /Project Based Learning/Self-Project

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program: B.Tech. in CE with Minor in AI&DS **Duration: 4 Years** **Total Credits: 171**

Teaching Scheme for Batch 2023-27

Semester-VIII

Course Code	Name of Course	Teaching Scheme			SH	Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)		IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	**Theory**								
	NIL								
A.2	**Practical**								
	NIL								
B.		**Minor Stream Courses/Department Electives**							
B.1	**Theory**								
	NIL								
B.2	**Practical**								
	NIL								
C		**Multidisciplinary Courses**							
	NIL	-	-	-					
D		**Ability Enhancement Courses (AEC)**							
	NIL	-	-	-					
E		**Skill Enhancement Courses (SEC)**							
	NIL	-	-	-					
F		**Value Added Courses (VAC)**							
	NIL	-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
BCECCE8301	Major Project			20		60	40	100	10
Total				20					**10**
Total Teaching Hours		**20**							

SH: Supporting Hours

*Classes will be conducted fortnightly

I SEMESTER

Code: BTXCSA1101	Basic Science for Engineers	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES

The Students will be able:

- Point out the basic principles of relativity, twin paradox and energy-mass relations
- Produce coherent sources and phenomenon of interference
- To learn about the laser and apply it for suitable applications manufacturing of cement and the chemistry involved in setting and hardening of it.
- To use their knowledge of polymers and its use in industries and daily life.
- To develop innovative methods to produce soft water for industrial use and potable water at cheaper cost

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Special Theory of Relativity	07
2.	Wave Optics	07
3.	Laser & Binding Materials	08
4.	Polymer	08
5.	Water Technology	06

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Special Theory of Relativity**
	• Introduction of Unit • Inertial and non-inertial frames of Reference. • Postulates of special theory relativity • Galilean and Lorentz Transformations, Length contraction and Time Dilation. • Relativistic Mass-Energy relation • Conclusion of Unit
2.	**Wave Optics**
	• Introduction of Unit • Interference of light**:** Types of interference, • Coherent source, methods to produce coherent sources with examples. • Newton's Rings: Principle, Construction, working &Applications • Conclusion of Unit
3.	**Laser & Binding Materials**
	• Introduction of Unit • Theory of laser action: Einstein's Coefficients, Components of laser, Threshold conditions for laser action • Theory, Design and Applications of He-Ne Laser • Cement: Composition and Significance of cement • Manufacturing of Portland cement by Rotary Kiln Technology • Chemistry of setting and hardening of cement and role of gypsum • Conclusion of Unit
4.	**Polymer**
	• Introduction of Unit • Classification of Polymers and Types of polymerization • Plastics: Constituents of plastics, Thermosets and Thermoplastics, Preparation, Properties and Uses of Polyethylene, Bakelite, Teflon and Nylon • Elastomers: Natural rubber, Vulcanization, Synthetic rubber- Preparation, Properties and Applications of

	SBR, Buna-N, Butyl and Neoprene rubber • Conclusion of Unit
5.	**Water Technology**
	• Introduction of Unit **Water** • Sources of water, Impurities in water and effect of impurities • Municipal water supply: Requisites of drinking water, Steps involved in purification of water, Sedimentation, Coagulation, Filtration and Disinfection, Break Point Chlorination **Water Analysis** • Hardness of water; Type of hardness, Degree of hardness, Units of hardness, Disadvantages of hard water, Determination of hardness by Complexometric (EDTA) method. • Treatment of hard water: Lime-soda method, Permutit (zeolite) method and Deionization or Demineralization method • Desalination: Reverse osmosis, Electrodialysis • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Fundamental of Optics	Jenkins and While	4th	Tata McGraw-Hill
2.	Optics	Ajoy Ghatak	3rd	Tata McGraw-Hill
3.	Introduction to special Theory of Relativity	R. Resnick	Latest	Johan Willy Singapore
4.	Engineering Chemistry	P.C. Jain	Latest	Dhanpat Rai&Sons
5.	Engineering Chemistry	S. S. Dara	Latest	S. Chand & Co

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**2**	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**2**	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Developmen

Code: BTXCCE1102	Fundamental of Computer	3 Credits [LTP: 3-0-0]

Course Outcomes: -

Students will be able to:

- Learn data types, loops, functions, array, pointers, string, structures and files.
- Develop conditional and iterative statements to write C programs.
- Implement concept of string using array.
- Allocate memory dynamically using pointers.
- Apply C Programming to solve real time problems.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to C Programming**	6
2.	**Decision Making & Looping**	6
3.	**Array and string**	8
4.	**Advance programming in C**	8
5.	**File handling & Additional features**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to C Programming**
	• Introduction of Unit • Introduction to computer-based problem solving, Program design and implementation issues- Flowcharts & Algorithms. • Types of Languages – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters. • Overview of C, Data Types, Constants & Variables, Literals, Operators & Expressions • Conclusion &Real Life Application
2.	**Decision Making & Looping**
	• Introduction of Unit • Decision making in C- if statement, if-else statement, Nested if statement, if else if Ladder, Switch case • Loop control in C – for loop, while loop • Control flow in C- break, continue and goto statement. • Conclusion &Real Life Application
3.	**Array and string**
	• Introduction of Unit • Array- 1D array, 2D array • Scope rules- Local & global variables. • Functions-parameter passing call by value and call by reference, calling functions with arrays, command line argument. • String – String in-build functions. • Conclusion of the Unit
4.	**Advance programming in C**
	• Introduction of Unit • Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions. • Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers. • Conclusion of the Unit
5.	**File handling & Additional features**
	• Introduction of Unit • File Handling – The file pointer, file accessing functions-fopen, fclose, putc, getc, fprintf, reading and writing into a file

	• Advance features- storage classes and dynamic memory allocation • C Preprocessor- #define, #include, #undef. • C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions. • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Letus C, 6th Edition	Yashwant Kanitkar	PBP Publication	Letus C ,6th Edition
2.	The C programming Language	Richie and Kenninghan	BPBPublication,2004	The C programming Language
3.	Programming in ANSI C3rd Edition, 2005	E.Balagurusamy	Tata McGraw Hill	Programming in ANSIC 3rd Edition, 2005
Reference Book				
1.	The C programming Language Richie and Kenninghan PBP Publication,2004			
2.	Programming in ANSI C 3rd Edition, 2005 Balaguruswmy Tata McGraw Hill			
Online Resources				
1.	https://www.programiz.com/c-programming/examples			
2.	https://www.w3resource.com/c-programming-exercises			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**2**	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**2**	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	2	-	-
CO4	**3**	-	-
CO5	2	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXCME1103/BTXCCV2102 Basics of Civil Engineering 3 Credits [LTP: 3-0-0]

Course Outcomes: -

Students will be able :

- To interpret various aspect, Novel areas and Career Prospects in Civil Engineering
- To learn about the use of different Construction Materials and techniques in Civil Engineering
- To identify the various building components, method of constructions and basic principles.
- To understand types of surveying works required
- To learn about the advancements in Civil Engineering

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to Civil Engineering**	08
2.	**Construction Materials and techniques**	08
3.	**Building Construction**	08
4.	**Basic Surveying**	08
5.	**Advancements in Civil Engineering**	08

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Civil Engineering**
	• Introduction • Different disciplines of Civil Engineering, Scope and prospects • Role of a Civil Engineer • Units of measurement, Unit conversion (Length, Area, Volume) • Heritage structures, architecture • Infrastructure Engineering. Sustainability • Automation and Robotics in Construction • Novel areas in Construction industry • Career Prospects in Civil Engineering
2.	**Construction Materials and techniques**
	• Introduction • Stone, Requirements of good building stone, General types of stone used in Construction. • Bricks, Modular and Standard bricks, Characteristics of good brick, Field tests on Bricks, Special bricks –fly ash bricks. • Timber, Structure of timber, General properties and uses of good timber, Use of bamboo in construction • Properties of lime, its types and uses • Asphalt, bitumen and tar used in construction, their properties and uses • Types of Stone Masonry (Rubble masonry, Ashlar Masonry) and Brick Masonry (English bond and Flemish bond).
3.	**Building Construction**
	• Introduction • Classification of Buildings as per National Building Code Group A to I • Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure • Building Components - Functions of Building Components, Substructure-Foundation, Plinth & Superstructure.

	• Selection of site for different types of Buildings • Basic principles of building planning.
4.	**Basic Surveying**
	• Introduction • Survey – Principles, purpose and use • Types & Classification of surveying • Instruments used in chain survey: Chains, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square • Ranging: Direct and Indirect Ranging • Methods of chaining, obstacles in chaining. • Errors in chain and tape, Numerical based on errors in length due to incorrect length of chain & tape.
5.	**Advancements in Civil Engineering**
	• Introduction • Smart city and it's features • Mass Transportation systems-BRTS, Metro • Rain water harvesting systems, Watershed Management • Green building, Energy efficient building • Development of River fronts • Heritage structures & its conservations • Features of affordable housing.

C.RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Basics of Civil Engineering	S.S. Bhavikatti	Latest	New Age International Publishers
2	Basic Civil Engineering	B C Punmia, Ashok K Jain, Arun K Jain	Latest	Laxmi Publications
3.	Basic Civil Engineering	G K Hiraska	Latest	Dhanpat Rai Publication
4.	Basic Civil Engineering	Jhonson Victor D and Esther Malini	Latest	Allied Publishers Limited, Madras
5.	Basic Civil Engineering	Arunachalam N	Latest	Pratheeba Publishers, Coimbatore
Important Web Links				
1.	https://nptel.ac.in/courses/105106201			
2.	https://onlinecourses.nptel.ac.in/noc20_ce02/preview			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	3	1	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	-	3
CO2	2	-	3
CO3	1	-	3
CO4	1	-	3
CO5	2	-	3

Code: BTXCEE1104/BTXCEE2103 Basics of Electrical and Electronics 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student will be able to:

- Apply basic electrical concepts, including various circuit analysis techniques and fundamentals of theorem, in practical applications.
- Analyze the fundamentals of AC circuits such as the R.M.S value, average value, active power, reactive power, power factor, form factor, peak factor and their applications.
- Analyze the energy conversion process and fundamentals of rotating and stationary electrical machines with their application in real life.
- Analyze the working of semiconductor devices such as Diode, BJT, UJT, photovoltaic cells, filters and fundamentals of digital electronics.
- Illustrate the concepts of Communication systems and Instrumentation engineering in practical applications.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Basic Concepts of Electrical Engineering**	08
2.	**Alternating Quantities and Electrical Installations**	08
3.	**Energy Conversion and Electrical Machines**	07
4.	**Basic Electronics**	08
5.	**Communication Systems and IoT**	08

A. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic Concepts of Electrical Engineering**
	• Introduction of Unit • Basic Concepts: Electric Current, Electromotive Force, Electric Power, Ohm's Law, Basic Circuit Components, Faraday's Law of Electromagnetic Induction. • DC Network Analysis & Theorems: Kirchhoff's Laws, Network Sources, Resistive Networks, Series-Parallel Circuits, Star-Delta Transformation, Node Voltage Method, Mesh Current Method, Super- Position, Thevenin's, Norton's and Maximum Power Transfer Theorems. • Conclusion of Unit
2.	**Alternating Quantities and Electrical Installations**
	• Introduction of Unit • Single Phase AC system: Introduction, Generation of AC Voltages, Root Mean Square and Average Value of Alternating Currents and Voltages, Form Factor, Peak Factor, Power Factor and Quality Factor, Phasor Diagram • Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries. Elementary calculations for energy consumption and savings, battery backup. • Conclusion of Unit
3.	**Energy Conversion and Electrical Machines**
	• Introduction of Unit • Introduction to Energy: Types of Energy, Introduction to Energy Conversion, Sources of Energy (Conventional & Non-Conventional), Energy Scenario in India & Rajasthan. • Rotating Machines: DC Machines: Principle of Operation of DC Machine as Motor and Generator, EMF Equation, Applications of DC Machines. AC Machines: Principle of Operation of 3-Phase Induction Motor, 3- Phase Synchronous Motor and 3- Phase Synchronous Generator

	(Alternator), Applications of AC Machines. • Conclusion of Unit
4.	**Basic Electronics**
	• Introduction of Unit • Semiconductor Devices: Conduction in Semiconductors, Conduction Properties of Semiconductor Diodes, Behavior of the PN Junction, PN Junction Diode, Zener Diode, LED, Photovoltaic Cell, Rectifiers, L, C, & L-C filters, BJT, UJT, Transistor as an Amplifier. • Digital Electronics: Boolean algebra, Binary System, Logic Gates and Their Truth Tables. • Conclusion of Unit
5.	**Communication Systems and IoT**
	• Introduction of Unit • Basics of Communication: Introduction, IEEE Spectrum for Communication Systems, Types of Communication, Amplitude and Frequency Modulation. • Basics of Instrumentation: Introduction to Transducers, Thermocouple, RTD, Strain Gauges, Load Cell and Bimetallic Strip. • An overview of Internet of Things-Building blocks of IoT, IoT enabling technologies, Characteristics of IoT systems and IoT levels, Evolution of the Internet paradigm, Device-to-Device/ Machine-to-Machine Integration • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1	Electrical and Electronic Technology	Edward Hughes et al,	Latest	Pearson Publication
2	Basic Electrical & Electronics Engineering	V. Jagathesan, K. Vinod Kumar & R. Saravan Kumar	Latest	Wiley India
3	Basic Electrical & Electronics Engineering	Van Valkenburge	Latest	Cengage learning
4	Basic Electrical and Electronics Engineering by,	Muthusubrmaniam	Latest	TMH
5	Basic Electrical & Electronics Engineering	Ravish Singh	Latest	TMH
Important Web Links				
1	https://nptel.ac.in/courses/108108076/			
2	https://nptel.ac.in/courses/117103063/			
3	https://nptel.ac.in/courses/108/101/108101091/			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	1	-	-	-	-	-
CO2	3	2	3	3	-	-	2	-	-	-	-	-
CO3	2	2	1	1	-	-	2	-	-	-	-	-
CO4	3	1	2	1	-	-	2	-	-	-	-	-
CO5	2	2	1	1	-	-	2	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	–	3
CO2	2	–	3
CO3	1	–	3
CO4	1	–	3
CO5	2	–	3

Code: BTXCSA1105/BTXCSA2104	Engineering Mathematics	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student would be able:

- To analyze and prove relationships between matrices, rank of matrix and systems of equations, Inverses.
- To analyze the basic structure of differential equations, and order and degree of the first order and first degree and its simple applications
- To calculate asymptotes of different curves. They will be able to know fundamentals of tracing the various types of cures and asymptotes play a main role in tracing.
- To utilize methods of integration to evaluate volumes and surface of objects and lengths of curves.
- To apply vector differentiation, and integration in the scalar and vector fields

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Matrices**	**07**
2	**Ordinary Differential Equations**	**08**
3	**Applications of Differential Calculus**	**08**
4	**Integral Calculus**	**08**
5	**Introduction Vector Calculus**	**08**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Matrices**
	• Introduction of Unit • Rank of a Matrix, Normal form of a Matrix • Consistency of systems of linear equations • Eigen Values and Eigen Vectors • Cayley-Hamilton Theorem (without proof) • Conclusion of Unit
2.	**Ordinary Differential Equations**
	• Introduction of Unit • First order and first-degree differential equations-Separable Variables, • Homogenous and reducible to homogenous equation • Linear Equation and reducible to linear form, Exact Equation • Linear differential equations with constant coefficients • Conclusion of Unit
3.	**Applications of Differential Calculus**
	• Introduction of Unit • Asymptotes • Multiple points • Curve tracing for standard Curves (Cartesian Curves only) • Conclusion & Real life applications
4.	**Integral Calculus**
	• Introduction of Unit • Gamma functions and their properties, beta function (only definition) • Double integrals, Double integral by changing into polar form, Areas by Double Integration • Change of order of integration • Conclusion of Unit
5.	**Vector Calculus**
	• Introduction of Unit • Scalar and Vector field • Differentiation and Integration of Vector functions • Gradient, Divergence and Curl, Directional derivatives

	• Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Higher Engineering Mathematics	B S Grewal	Latest	Khanna Publications, Delhi,
2.	Higher Engineering Mathematics	Ramana, B.V	Latest	Tata McGraw-Hill.
3	Engineering Mathematics: A Tutorial Approach	Ravish R Singh and M Bhatt	Latest	Tata McGraw-Hill
4	Calculus and Analytical Geometry	Thomas and Finney,	Latest	Narosa Publishing, New Delhi
5	Advanced Engineering Mathematics	Erwin Kreyszig	Latest	John Wiley and Sons
Important Web Links:				
1	https://nptel.ac.in/courses/111105134/			
2	https://nptel.ac.in/courses/122/101/122101001/			
3	https://www.classcentral.com/course/swayam-engineering-mathematics-i-13000			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

Code:BTXCME2106/BTXCME2105 Basic of Mechanical Engineering 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student would be able to:

- Analyze various metal forming processes
- Illustrate application of IC engine
- Analyze various application of refrigeration and air conditioning
- List out various electrical devise
- Analyze various ergonomics design

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Primary Manufacturing Processes**	**08**
2	**IC Engines**	**08**
3	**Refrigeration and Air Conditioning and Aerodynamics**	**07**
4	**Electric Vehicles**	**08**
5	**Ergonomics**	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Primary Manufacturing Processes**
	• Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. • Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. • Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.
2	**IC Engines**
	• Classification - SI and CI engine operation - two stroke and four stroke engines - construction - working principle. Theoretical and actual indicator diagrams - calculation of power - efficiency. • Valve and port timing diagram - stages of combustion in SI and CI engine - abnormal combustion - combustion chamber.
3	**Refrigeration and Air Conditioning and Aerodynamics**
	• Introduction, classification and types of refrigeration systems and air-conditioning. • Applications of refrigeration and Air-conditioning. • Basics of aerodynamics, Jet propulsion.
4	**Electric Vehicles**
	• Architecture of an electric vehicle • Essentials and performance of electric vehicles –Traction motor characteristics, tractive effort, transmission requirements • Vehicle performance, energy consumption, advantage and limitations.
5	**Ergonomics**
	• Introduction • Seating dimensions, interior ergonomics • Ergonomics system design, seat comfort, suspension seats, split frame seating, back pain reducers • Dash board instruments, electronic displays, commercial vehicle cabin ergonomics, mechanical package layout, goods vehicle layout.

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1	Basics of Mechanical Engineering	Punia	Latest	Dhanpat Rai
2	Basics of Mechanical Engineering	R.K. Rajput	Latest	Laxmi
3	Basics of Mechanical Engineering	DS Kumar	Latest	Kataria
Important Web Links				
1	NPTEL			
2	Khan Academy			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	3	1	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	—	3
CO2	2	—	3
CO3	1	—	3
CO4	1	—	3
CO5	2	—	3

Code: BTXCSA1201	Basic Science lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOMES

Students will be able to:

- Learn the concept of interference by the help of Newton's ring & Michelson Interferometer
- Learn the dispersive power of the material of the prism & resolving power of the telescope
- analyze hardness strength of Ferrous Ammonium sulphate solution and CuSO4 solution.
- analyze hardness of water
- handle different instruments & analytical techniques

A. LIST OF EXPERIMENTS:

1	To determine the wavelength of sodium light by using Newton's Ring.
2	To determine the coherent length and coherent time by using He-Ne-Laser.
3	To measure the numerical aperture of an optical fiber by He-Ne laser.
4	To determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
5	To specify the specific resistance of a material of a wire by carey Foster Bridge.
6	To determine the dispersive power of a prism for violet, yellow and red colour of mercery light with the help of spectrometer
7	To determine the strength of $CuSO_4$ solution with the help of hypo solution
8	To determine the strength of Ferrous Ammonium sulphate solution with the help of $K_2Cr_2O_7$ solution using diphenyl amine as internal indicator
9	To determine the hardness of water by EDTA method.
10	Synthesis of Bakelite
11	To determine the viscosity of a given lubricating oil by Redwood viscometer
12	To determine the flash and fire point of a given lubricating oil

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXCCE1202	Programming in C Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOME: -

Students will be able to:

- Gain concept of functional hierarchical code organization.
- Work with textual information, characters and strings
- Implement file handling concepts
- Implement real time applications using the power of C language features.
- Overcome and solve possible errors during program execution.

A. LIST OF EXPERIMENTS:

1	Given the values of the variables x, y and z, write a program to rotate their values such that x has the value of y, y has the value of z, and z has the value of x
2	Write a program that reads a floating point number and then displays the right-most digit of the integral part of the number.
3	Write a C program to calculate the sum of digits of given number.
4	Program to find largest and smallest number from four given number.
5	Program to find whether a year is leap or not
6	Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number.
7	Write a C Program to convert Decimal number to Binary number
8	Find the sum of this series upto n terms 1+2+3+4+5+6+……..
9	Program to print Armstrong's numbers from 1 to 100.
10	Write a program to convert years into Minute, Hours, Days, Months, Seconds using switch () statements
11	Write a C menu driven program
12	Write a program to generate the various pattern of numbers
13	Write a C Program to print the reverse of an integer number
14	Write a C program to perform the factorial of given number
15	Write a C program in which a function prime that returns 1 if its argument is a prime and return zero otherwise.
16	Write a C program to calculate factorial of a number using recursion.
17	Write a C program in which enter 10 elements by the user and perform the operation of sorting in ascending order
18	Write a C program to perform to perform Matrix addition and multiplication operations.
19	Write a program to determine the length of the string and find its equivalent ASCII codes.
20	Write a program to delete all the occurrences of the vowels in a given text. Assume that the text length will be of one line
21	Write a program to maintain the library record for 100 books with book name, author's name, and edition, year of publishing and price of the book.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Let us C	Yashwant Kanetkar	6th Edition	PBP Publication
2	The C programming Language	Richie and Kenninghan	2nd Edition	PBP Publication,2004

			2004	
3	Programming in ANSI C	E Balaguruswamy	3rd Edition, 2005	Tata McGraw Hill
Reference Book				
1.	The C programming Language by Richie and Kenninghan, PBP Publication,2004			
2.	Programming in ANSI C 3rd Edition, 2005 by E.Balagurusamy, Tata McGraw Hill			
Online Resources				
1.	https://www.programiz.com/c-programming/examples			
2.	https://www.w3resource.com/c-programming-exercises			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	-	-	2	-	-	-	-	-
CO2	2	3	3	1	-	-	2	-	-	-	-	-
CO3	3	2	2	3	-	-	2	-	-	-	-	-
CO4	2	1	1	2	-	-	2	-	-	-	-	-
CO5	3	1	2	1	-	-	2	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXCCV1203/BTXCCV2202 Computer Aided Design (CADD) 1 Credits [LTP:0-1-2]

COURSE OUTCOMES:-

Students will be able to:

- Apply basic concepts to develop construction (drawing) techniques.
- Analyze drawings through editing and plotting techniques
- Apply basic tools to develop outlines in drawings.
- Apply tools to control and manage the drawings in AutoCAD for different purposes
- Create the layout of plans in workspace.

A. LIST OF EXPERIMENTS

1.	• Introduction to AutoCAD and Drawing Tools • Draw Different Shapes using Line, Polyline Circle, and Polygon.
2.	• Draw Different Shapes using Rectangle • Use of Dimensions in Circle, rectangles, Line and other shapes.
3.	• Modify Drawings in AutoCAD using Modification Tools. • Offset and Mirror Different Shapes and Lines.
4.	• Use Trim, Extend &Align, Scale and Strech Command.
5.	• Use of Text, Line, Block and Conversion Tools.
6.	• Introduction to Layers, How to add, Modify layers in layer manager.
7.	• Introduction of Hatch Command in AutoCAD
8.	• Opening and Modifying properties in AutoCAD.
9.	• Layout Design of Building
10.	• 2D Plan of Residential Structure

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	2	3	1	2	–	–	–	–	–	–	–	–
CO3	3	2	2	2	–	–	–	–	–	–	–	–
CO4	3	3	1	2	–	–	–	–	–	–	–	–
CO5	3	3	2	2	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	–	3
CO2	2	–	3
CO3	1	–	3
CO4	1	–	3
CO5	2	–	3

Code: BTXCEE1204/BTXCEE2203 Basics of Electrical and Electronics lab 1 Credits [LTP:0-1-2]

COURSE OUTCOMES:-

Students will be able to:

- Analyze the house wiring connections of various equipments such as energy meter, ceiling fan, tubelight etc.
- Create the connections of single phase and three phase induction motors.
- Create circuits and connects of various electrical components such as Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, etc.
- Analyze the effect of L, C and L-C filters in single phase half wave and full wave bridge rectifier
- Analyze the effect of LC and LC filters in current and power rectifiers

A. LIST OF EXPERIMENTS:

1	Assemble house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring.
2	Prepare the connection of ceiling fan along with the regulator and vary the speed.
3	Prepare the connection of single phase induction motor through 1-Phase Auto-transformer and vary the speed.
4	Prepare the connection of three phase squirrel cage induction motor through 3-Phase Autotransformer and vary the speed.
5	Prepare the connection of Fluorescent Lamp, Sodium Vapour and Halogen Lamp and measure voltage, current and power in the circuit.
6	Identification, testing and application of Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, BJT, Photo Diode, Photo Transistor, Analog/Digital Multi- Metres and Function/Signal Generator.
7	Measure the frequency, voltage, current with the help of CRO.
8	Assemble the single phase half wave and full wave bridge rectifier & the analyse effect of L, C and L-C filters in rectifiers.
9	Study the BJT amplifier in common emitter configuration. Measure voltage gain plot gain frequency response and calculate its bandwidth.
10	Verify the truth table of AND, OR, NOT, NOR and NAND gates
11	Prepare the connection of sodium lamp and measure voltage
12	Analyze the effect of LC and LC filters in current and power rectifiers
Virtual Lab	
1	http://vlabs.iitkgp.ernet.in/be/
2	http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	2	3	1	2	–	–	–	–	–	–	–	–
CO3	3	2	2	2	–	–	–	–	–	–	–	–
CO4	3	3	1	2	–	–	–	–	–	–	–	–

CO5	3	3	2	2	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	**PSO2**	**PSO3**
CO1	1	–	3
CO2	2	–	3
CO3	1	–	3
CO4	1	–	3
CO5	2	–	3

Code: BTXCME1205/BTXCME2205 WORKSHOP PRACTICE 1 Credit [LTP: 0-1-2]

COURSE OUTCOMES:-

Students will be able to:

- Create a model of T Lap and T- Briddle Joint through carpentry shop
- Analyze the making of prototype model through foundry shop
- Analyze the difference between gas welding and arc welding and their applications
- Create a model on fitting shop through filling, drilling and tapping operation
- Analyze the difference between forging, moulding and casting

A. LIST OF EXPERIMENTS

1	**Carpentry Shop** • Timber, definition, engineering applications, seasoning and preservation • Plywood and ply boards
2	**Foundry Shop** • Moulding Sands, constituents and characteristics • Pattern, definition, materials types, core prints • Role of gate, runner, riser, core and chaplets • Causes and remedies of some common casting defects like blow holes, cavities, inclusions
3	**Welding Shop** • Definition of welding, brazing and soldering processes and their applications • Oxyacetylene gas welding process, equipment and techniques, types of flames and their applications • Manual metal arc welding technique and equipment, AC and DC welding • Electrodes: Constituents and functions of electrode coating, welding positions • Types of welded joints, common welding defects such as cracks, undercutting, slag inclusion and boring
4	**Fitting Shop** • Files, materials and classification.
5	**Smithy Shop** • Forging, forging principle, materials • Operations like drawing, upsetting, bending and forge welding • Use of forged parts

List of Jobs to be made in the Workshop Practice

1.	**Carpentry Shop** 1. T – Lap joint 2. Bridle joint
2.	**Foundry Shop** 3. Mould of any pattern
3.	**Welding Shop** 4. Square butt joint by MMA welding 5. Lap joint by MMA welding
4.	**Machine Shop Practice** 6. Job on lathe with facing operation 7. Job on lathe with one step turning and chamfering operations 8. Job on shaper for finishing two sides of a job
5.	**Fitting Shop** 9. Finishing of two sides of a square piece by filing 10. Drilling operation on fitted job (two holes) 11. Slotting operation on fitted job 12. Tapping operation on fitted job

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	2	3	1	2	–	–	–	–	–	–	–	–
CO3	3	2	2	2	–	–	–	–	–	–	–	–
CO4	3	3	1	2	–	–	–	–	–	–	–	–
CO5	3	3	2	2	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	—	3
CO2	2	—	3
CO3	1	—	3
CO4	1	—	3
CO5	2	—	3

Code: BTXCME1206/BTXCME2206 **Engineering Graphics** **1 Credit [LTP: 0-1-2]**

COURSE OUTCOME: -

Students will be able to:

- Apply the concept of scale and their applications
- Analyze the different applications of conic section and engineering curves and also how to draw on sheet
- Analyze the use of projection and also analyze the difference between first and third angle projection method
- Apply the concepts of sectioning, true section and apparent section and create the sectional views of the engineering components.
- analyze the development of surface and analyze the sheet metal requirement for fabricating a surface.

A. List of Experiments

1.	• Lines, Lettering and Dimension (Sketch Book) • Scales: Representative Fraction, plain scales, diagonal scales, (In drawing sheet 1)
2.	• Conic Sections: Construction of ellipse, parabola and hyperbola by different methods(in drawing sheet) Engineering Curves: Construction of Cycloid, Epicycloids, Hypo-cycloid(in drawing sheet 2)
3.	• Type of Projection, Orthographic projection: first angle and third angle projection (in drawing sheet) • Projection of Points • Projection of Straight lines • Projection of planes: Different positions of plane lamina like: regular polygon, circle of three planes (four problems in drawing sheet) • Projection of Solids: Projection of right and regular polyhedron, cone (four problem in drawing sheet 3)
4.	• Orthographic Projections (3 Problems in drawing sheet 4)
5.	Sectional Views (2 Problems) and Riveted joints, lap joints, butt joints, chain riveting (drawing sheet 5)

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	—	—	—	—	—	—	—	—
CO2	2	3	1	2	—	—	—	—	—	—	—	—
CO3	3	2	2	2	—	—	—	—	—	—	—	—
CO4	3	3	1	2	—	—	—	—	—	—	—	—
CO5	3	3	2	2	—	—	—	—	—	—	—	—

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	—	3
CO2	2	—	3
CO3	1	—	3
CO4	1	—	3
CO5	2	—	3

Code: BTXCEE1207/BTXCCE2207	Exploratory Project	1 Credits [LTP: 0-0-2]

LAB OUTCOMES: After Successful completion of the lab students will be able to-

LO1 Predict a problem of current relevance to society
LO2 Formulate the problem and identify suitable modelling paradigm
LO3 Categorize the problem and identify the solution methodology
LO4 Simulate and design systems using various modern tools
LO5 Validate the results and prepare a project report

GUIDELINES:

- The Project group must complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
- The group should maintain a log book of activities. It should have entries related to the worked one, problems faced, solution evolved etc., duly signed by guide.
- The guides should regularly monitor the progress of the project work.
- The project work along with project report should be submitted as part of term work in first term on or before the last day of the second term.
- Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
- Assessment of the project forward of marks shall be done by the guide and a departmental committee.
- The guide should be internal examiner for oral examination.
- The external examiner should be from the related area of the concerned project. He should have experience at degree level / industry.
- The evaluation at final oral examination should be done jointly by the internal and external examiner.

Phases:
Project work is divided into the following phases:
Phase I

- Allocation of groups(Max. 4 Members & Min. 2 Members) & guide
- Black board presentation on topics as per the choice & feasibility
- Submission of abstract & synopsis of the project

Phase II

- Procurement of the components
- 2D/3D figure or model
- Paper work like any circuit diagram and tentative cost

Phase III

- Working Model of the project
- Mounting the components
- Final hardware evaluation/presentation
- Submission of the final hardware to the coordinator.

Phase V

- Final report submission (after project exhibition)
- Paper presentation on the selected project in seminars /conferences/journals
- Viva voce

Deadlines of Phases:
The Project will be covered in 13 weeks from starting of semester. The time allocated to each phase is as follow:
Phase -1: Maximum 2 weeks
Phase -2: Maximum 3 weeks
Phase -3: Maximum 6 weeks
Phase- 4: Maximum 2 weeks
Distribution of Marks:-

Total Marks 100

Break up of marks (100)

Performance of Phase 1	:15
Performance of Phase 2	:20
Performance of Phase 3	:20
Performance of Phase 4	:45
Total	:**100**

Note: 1. Performance marks of Phase 1/2/3/4 will be given by Coordinators, Guide and external (if any) on completion of the respective phase.

2. Presentation and demonstration will be taken by Project Coordinator, Guide.

3. Guide feedback will be collected by Project Coordinator.

Code:BUACHU1101	English	2 Credits [LTP: 2-0-0]

COURSE OUTCOMES:

The students would be able to

C01: Understand the mechanism of language and linguistic creativity to communicate with each other.
apply writing skills effectively for a variety of professional and social communication

C02: Understand the importance of intonation, word and sentence stress for improving communicative competence and foster social and emotional Learning.

C03: Apply writing skills effectively for a variety of professional and social communication.

C04: understand the structured conversation to make their point of views clear to the listeners by reading short stories written in English.

C05: Apply Literary expressions in academic writing.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Grammar and Usage I	7
2.	Grammar and Usage II	8
3.	Composition	6
4.	Poems	8
5.	Short Stories & Essays	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Grammar and Usage I**
	• Introduction to the Unit • Tense • Active and Passive Voice • Modals • Articles • Conclusion & Real Life Application
2.	**Grammar and Usage II**
	• Introduction to the Unit • Parts of Speech • Direct and Indirect Speech • Conditionals • Conclusion & Real-Life Application
3.	**Composition**
	• Introduction to the Unit • Letter writing • Report & Review Writing • Precis Writing • Conclusion & Real-Life Application
4.	**Poems**
	• Introduction to the Unit • She walks in Beauty by Lord Byron • Stopping by Woods on a Snowy Evening by Robert Frost • Toads by Philip Larkin • The Indian Weavers by Sarojini Naidu • Conclusion & Real Life Application

5.	Short Stories & Essays
	• Introduction to the Unit • The Birthmark by Nathaniel Hawthorne • The Night Train at Deoli by Ruskin Bond • Shooting an Elephant by George Orwell • Of Adversity by Francis Bacon • Conclusion & Real Life Application

C: **Recommanded Study Material**

Sr. No	Reference Book	Author	Publication
1.	English Literature	Benjamin W. Griffith	1882
2.	English Literature: Its History and Significance	William J.Long	2012
3.	English Grammar and Composition	Wren & Martin	2017

BULCSE1201	Skill Enhancement Generic Course	1 Credits [0-0-2}

COURSE OUTCOMES: On completion of the course a student will be able to:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

LIST OF ACTIVITIES	
1	SMART Goals, Goal Setting (IKIGAI), Wheel of Satisfaction, Exchanging pleasantries
2	Root Words, Prefix-Suffix, Antonyms, Synonyms & Analogies, Sentence Correction-1
3	Numbers, Relations & Functions, HCF & LCM, Average & Divisibility
4	Resume Tips & Resume Review
5	How to win friends & Influence people, Sentence Correction-2
6	Series & Progressions
7	Number Series & Letter Series, Crypto-arithmetic, SWOT/SWOC
8	Percentage, Profit & Loss, Ratio Proportion, CI & SI
9	Mixtures and Allegations, Short Cut Tricks, Seating Arrangement, Sequencing & Ranking
10	Surds & Indices, Problem on ages, Solving Equations - Quadratic & Linear
11	Time & Distance, Boats & Streams, Clocks and Calendars
12	GD, Practice of GD, Reading and Comprehension

Code:BUVCSA1102	Environmental Studies	3 Credits [LTP: 3-0-0]

COURSEOUTCOMES:
Students would be able to:

CO1: Understand the scope of environmental studies and explain the concept of ecology, ecosystem and biodiversity.
CO2: Implement innovative ideas of controlling different categories of Environmental Pollution.
CO3: Explain different environmental issues together with various Environmental Acts, regulationsand International Agreements.
CO4: Summarize social issues related to population, resettlement and rehabilitation of project affected persons and demonstrate disaster management with special reference to floods, earthquakes, cyclones,landslides.
CO5: Determine the local environmental assets with simple ecosystems and identify local flora and fauna.

A. **OUTLINE OF THE COURSE**

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Environmental Studies	5
2.	Environmental Pollution and its Control	5
3.	Environmental Policies & Practices	5
4.	Human Communities and the Environment	5
5.	Field Work	4

B..**DETAILED SYLLABUS**

Unit	Unit Details
1	**Introduction to Environmental Studies**
	• Introduction of Unit • Multidisciplinary nature of environmental studies Concept of sustainability and sustainable development. • Ecosystem: Structure and function of ecosystem • Energy flow in an ecosystem: food chains, food webs and ecological succession. Casestudies Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desertecosystem Aquatic ecosystems • Biodiversity and Conservation • Conclusion & Real Life Application
2	**Environmental Pollution and its Control**
	• Introduction of Unit • Environmental pollution: types, causes, effects and controls; Air, water, soil and noisevpollution Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies • Conclusion & Real Life Application
3	**Environmental Policies & Practices**
	• Introduction of Unit • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. • International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD) • Conclusion & Real Life Application

4	**Human Communities and the Environment**
	• Introduction of Unit • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Conclusion & Real Life Application
5	**Field Work**
	• Introduction of Unit • Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. • Study of common plants, insects, birds and basic principles of identification. • Study of simple ecosystems-pond, river, Delhi Ridge, etc. • Conclusion & Real Life Application

C: **Recommanded Study Material**

Sr. No	Reference Book	Author	Publication
1.	Environmental Studies	Erach Barucha	UGC
2.	Environmental Studies	Benny Joseph	Tata Mcgraw Hill
3.	Environmental Studies	R. Rajagopalan	Oxford University Press
4.	Principles of Environmental Science and Engineering	P. Venugoplan Rao	(Prentice Hall of India.
5	Environmental Science and Engineering	Meenakshi	Prentice Hall India

II SEMESTER

Code: BTXCCE2101	Python Programming	3 Credits [LTP: 3-0-0]

COURSE OUTCOME:

Students will be able to:

- Understand the basic terminology used in computer programming to write, compile and debug programs in Python programming language.
- Use different data types to design programs involving decisions, loops, and functions for problem solving
- Apply various object oriented programming
- Handle the exceptions which are raised during the execution of Python scripts
- Implement files and classes in the Python programming environment

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction to Python Programming**	**07**
2.	**Python Operators and Control Flow statements**	**09**
3.	**Data Structures, Python Functions and Packages**	**09**
4.	**Object Oriented Programming**	**08**
5.	**File I/O Handling and Exception Handling**	**09**

B. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Introduction to Python Programming**
	• Introduction to Unit • What is Python, • Uses of Python Programming Language / Python Applications • Features of Python Programming Language • Python-2 and Python-3 differences • Python environment setup — Installation and working of IDE • Running Simple Python scripts to display 'welcome' message. • Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of data types • Python building blocks — Identifiers, Keywords, Indention, Variables, Comments • Conclusion of unit
2.	**Python Operators and Control Flow statements**
	• Introduction to Unit • Basic Operators: Arithmetic, Comparison/ Relational, Assignment, Logical, Bitwise, Membership, Identity operators, Python Operator Precedence • Control Flow: • Conditional Statements (if, if ... else, nested if) • Looping in python (while loop, for loop, nested loops) • Conclusion of Unit
3.	**Data Structures, Python Functions and Packages**
	• Introduction to Unit • Lists, Tuple, Sets, Dictionaries • String and Slicing • Use of Python built • User defined functions and its types • Command-line Arguments • Using standard packages (e.g. math, scipy, Numpy, pandas etc.)

	• Conclusion of Unit
4.	**Object Oriented Programming**
	• Introduction of Unit • Creating Classes and Objects • Inheritance • Method Overloading and Overriding • Data Hiding • Types of Methods : Instance Methods , Static Methods , Class Methods • Accessing attributes , Built-In Class Attributes • Conclusion of Unit
5.	**File I/O Handling andException Handling**
	• Introduction of Unit • Types of File • File Objects, File Built-in Function, File Built-in Methods • File Built-in Attributes • Read/write operations Reading Text • Errors in Python : Compile-Time Errors ,Runtime Errors , Logical Errors • try….except…else, try-finally clause • Regular expressions • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

S. No	Text Books:	Author	Edition	Publication
1.	Core Python Programming	Chun, JWesley	2007	Pearson,
2.	Head First Python	Barry,Paul	2010	ORielly,
Reference Book				
1	Learning Python Lutz, Mark O Rielly, 2009			
Online Resources				
1	https://www.learnpython.org/			
2	https://realpython.com/start-here/			
3	https://www.programiz.com/python-programming			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXCCE2201	PYTHON PROGRAMMING LAB	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES

The student will be able to:

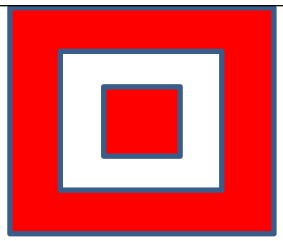
- Understand why Python is a useful scripting language for developers.
- Identify the key issues in Python code, develop and experiment with python programming.
- Develop problem solving and critical thinking skills in fundamental enable techniques like conditionals and loops.
- Construct and explain with structure and concept of different data type like, List and Dictionary.
- Implement read and write data from/to files in Python Develop Python programs step-wise by defining functions with tinker.

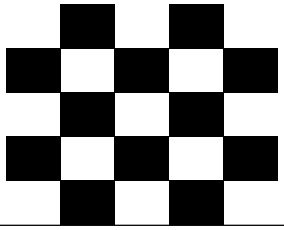
A. List of Programs:

<table>
<tr><th colspan="2">Part A</th></tr>
<tr><td></td><td>1. Write and run a Python program that outputs the value of each of the following expressions:
5.0/9.0
5.0/9
5/9.0
5/9
9.0/5.0
9.0/5
9/5.0
9/5

Based on your results, what is the rule for arithmetic operators when integers and floating point numbers are used?
2. Write and run a Python program that asks the user for a temperature in Celsius and converts and outputs the temperature in Fahrenheit. (Use the formula given in the example above and solve for tempFin terms of tempC.)
3. Here is an algorithm to print out n! (n factorial) from 0! to 19!:
1. Set f = 1
2. Set n = 0
3. Repeat the following 20 times:
a. Output n, "! = ", f
b. Add 1 to n
c. Multiply f by n
Using a for loop, write and run a Python program for this algorithm.
4. Modify the program above using a while loop so it prints out all of the factorial values that are less than 1 billion.
5. Modify the first program so it finds the minimum in the array instead of the maximum.
6. (Harder) Modify the first program so that it finds the index of the maximum in the array rather than the maximum itself.</td></tr>
<tr><th>Part B</th><th></th></tr>
<tr><td></td><td>7. Modify the bubble sort program so it implements the improvements discussed in class. (HINT: To exit the main loop if the array is already sorted, simply change the loop variable to equal the last value so the loop ends early.)
8. Draw the Target symbol (a set of concentric Squares, alternating red and white) in a graphics window that is 200 pixels wide by 200 pixels high. Hint: Draw the largest circle first in red, then draw the next smaller circle in white, then draw the next smaller circle in red. Graphical objects drawn later appear "on top of" graphical objects drawn earlier.</td></tr>
</table>

	9. Try entering the following literal values at the prompt. (Hit ENTER after each) **-5** **-4.2** **4.5** **4.14** **0.90** Something odd should occur. *Describe it on paper.* 10. Create a 5 X 5 rectangle whose top left corner is at (*row**5, *col**5). (Where is the bottom right corner?) If the sum of the *row* and *col* numbers is even, set the fill color of the rectangle to white, otherwise set it to black. Then draw the rectangle.





B. RECOMMENDED STUDY MATERIAL:

S. No	Text Books:	Author	Edition	Publication
1.	Core Python Programming	Chun, JWesley	2007	Pear son,
2.	Head First Python	Barry,Paul	2010	ORielly,
Reference Book				
1	Learning Python Lutz, Mark O Rielly, 2009			
Online Resources				
1	https://www.learnpython.org/			
2	https://realpython.com/start-here/			
3	https://www.programiz.com/python-programming			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	-	-	2	-	-	-	-	-
CO2	2	3	3	1	-	-	2	-	-	-	-	-
CO3	3	2	2	3	-	-	2	-	-	-	-	-
CO4	2	1	1	2	-	-	2	-	-	-	-	-
CO5	3	1	2	1	-	-	2	-	-	-	-	-

A. MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	**3**
CO2	2	-	**3**
CO3	3	-	**3**
CO4	2	-	**3**
CO5	1	-	**3**

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXECE2111	Introduction to Artificial Intelligence	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Analyze various agents in AI
- Apply Search techniques to solve problem
- Solve the Constraint Satisfaction Problems using AI methods
- Implement Adversarial Search in Game Playing
- Solve real world problems using AI techniques

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Artificial Intelligence**	**07**
2.	**Problem solving by Search**	**08**
3.	**Constraint Satisfaction Problems**	**07**
4.	**Software Agents**	**07**
5.	**AI applications**	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Artificial Intelligence**
	• Introduction to Artificial Intelligence • Definition of Artificial Intelligence • A brief history of Artificial Intelligence • Why do we study AI? • What is AI? • Views of AI: Acting Humanly, Thinking Humanly, Thinking Rationally and Acting Rationally • Areas of AI • Agents and environments • PEAS (Performance measure, Environment, Actuators, Sensors) • Environment types • Agent types: Simple reflex agents, Model-based reflex agents, Goal-based agents and Utility-based agents • Examples of Agent • Conclusion of the Unit
2.	**Problem solving by Search**
	• Introduction of Unit • Problem-solving agents • Problem formulation • Example problems: 8-Puzzle problem and 8-queens problem • Basic search algorithms • Un-informed search strategies: Breadth-first search, Depth-first search, Depth-limited search, Uniform-cost search and Iterative deepening search • Informed Search Algorithms: Best-first search, Greedy best-first search, A* search, Hill-climbing search, and Genetic algorithms • Conclusion of the Unit
3.	**Constraint Satisfaction Problems**
	• Introduction to Constraint Satisfaction Problems (CSP) • Why do we need to consider CSPs? • Constraint Propagation • CSP Vs Search problems • Real-world CSPs • Finite vs. Infinite CSP • CSP as a Search Problem : Backtracking search for CSPs, Forward checking for CSPs and Local search for CSPs

	• Conclusion of the Unit
4.	**Adversarial Search and Game Playing**
	• Introduction to Adversarial Search and Game Playing • Games: Definition, Search vs. Games and Game Tree • Optimal decisions in Games: Mini max algorithm and α-β pruning with example • Imperfect, real-time decisions • Partially Observable Games • State-of-the-Art Game Programs: Chess on Deep Blue, Chess on standard PCs, Checkers on Chinook and Backgammon: TD-Gammon • Conclusion of the Unit
5.	**AI Applications**
	• Introduction of Unit • Language Models • Information Retrieval, Extraction • Natural Language Processing • Machine Translation • Speech Recognition • Expert system: Introduction, phases, architecture, Expert system Vs Traditional system • Robot, Hardware , Planning, Moving • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Artificial Intelligence: A Modern Approach	S. Russell and P. Norvig	Third Edition	Prentice Hall
2.	Prolog: Programming for Artificial Intelligence	I. Bratko	Fourth edition	Addison-Wesley Educational Publishers Inc
Reference Book				
1.	Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, M. Tim Jones.			
2.	The Quest for Artificial Intelligence, Cambridge University Press, Nils J. Nilsson.			
3.	Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, William F. Clocksin and Christopher S. Mellish.			
4.	Multi Agent Systems, Second Edition, MIT Press, Gerhard Weiss.			
5.	Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, David L. Poole and Alan K. Mackworth.			
Online Resources				
1.	https://onlinecourses.nptel.ac.in/noc21_ge20/preview			
2.	https://www.coursera.org/learn/introduction-to-ai			
3.	https://www.javatpoint.com/artificial-intelligence-tutorial			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**2**	**2**	**-**		**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**3**	**2**	**-**		**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXECE2112	INTRODUCTION TO CYBER SECURITY	3 Credit [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Know basic concepts and importance of information security and cryptography.
- Recognize the business need for information security.
- Gain knowledge about advance cryptographic algorithms and Identify security issues and objectives in computer systems and networks.
- Learn about cryptographic key management.
- Know how message digests are used in authentication.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction to Information Security**	8
2	**The Need for IT Security – I**	8
3	**Advance Algorithms and Techniques**	8
4	**Key Management**	8
5	**Cryptography in User Authentication**	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Information Security**
	• Introduction of Unit • Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System • Overview of Cryptography (What is Cryptography, Principles of Cryptography Techniques) • Understanding Mono-Alphabet Substitution Cryptographic Algorithms (Caesar Cipher, Stream Cipher) • Understanding Multi-Alphabet Substitution Cryptographic Algorithms (Simple substitution, Polyalphabetic substitution) • Conclusion of the Unit
2.	**The Need for IT Security – I**
	• Introduction of Unit • Business Needs-Protecting the functionality • Enabling the safe operations • Protecting the data, safe guarding the technology assets • Conclusion of the Unit
3.	**Advance Algorithms and Techniques**
	• Introduction of Unit • Understanding Birthday Attack (What is Birthday Paradox, how to avoid it) • Asymmetric Key Algorithms and types (RSA, Diffie-Hellman key exchange, DSA) • Conclusion of the Unit Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering • Conclusion of the Unit
4.	**Key Management**
	• Introduction of Unit • The basic functions involved in key management including creation • Distribution, verification, revocation and destruction, • Storage, recovery and life span and how these functions affect cryptographic integrity • Conclusion of the Unit
5.	**Cryptography in User Authentication**
	• Introduction of Unit • Basics of authentication, tokens, • Certificate-based and biometric authentication, • Extensible authentication protocols, and message digest, Security handshake • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Publication
1	Cryptography and Network Security	Atul Kahate	McGraw Hill India, 2017
2	Cryptography and Network Security	S. Bose	Pearson India , 2016
3	Information security: Principles and Practice	Mark Stamp	John Wiley & Sons, Inc., 2011

Reference Book	
1.	Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education
2.	Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
3	Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
Online Resources	
1.	https://www.sans.org/cyber-security-courses/introduction-cyber-security/
2.	https://nptel.ac.in/courses/106106129

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**2**	**-**	**2**		**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**1**	**2**	**-**		**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**1**	**2**	**-**	**2**		**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXECE2113	INTRODUCTION TO CLOUD	3 Credits [3-0-0]

COURSE OUTCOME:

Students will be able to:

- Explain the core concepts of the cloud computing paradigm
- Learn the underlying principles of Cloud Technology and various types of cloud Computing architecture and types.
- Learn to evaluate between different cloud solutions offered by various providers based on their merits and demerits.
- Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

A. OUTLINF OF THE COURSE

Unit	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	7
2	**Cloud Computing Companies and Migrating to Cloud**	8
3	**Cloud Cost Management and Selection of Cloud Provider**	8
4	**Governance in the Cloud**	8
5	**Ten cloud do's and do not's**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction**
	• Introduction to Unit • Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private and Public clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, Practical applications of cloud computing, Cloud computing delivery models and services (IaaS, PaaS, SaaS) • Obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, • Practical applications of cloud computing • Conclusion of the Unit
2.	**Cloud Computing Companies and Migrating to Cloud**
	• Introduction to Unit • Web-based business services, Delivering Business Processes from the Cloud: Business process examples, • Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud • Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies • Conclusion of the Unit
3.	**Cloud Cost Management and Selection of Cloud Provider**
	• Introduction to Unit • Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, selecting the right scalable application. • Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration • Conclusion of the Unit
4.	**Governance in the Cloud**

	• Introduction to Unit • Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing • Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration • Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations • Conclusion of the Unit
5	**Ten cloud do's and do not's**
	• Introduction to Unit • Don't be reactive • do consider the cloud a financial issue • don't go alone • do think about your architecture • don't neglect governance • don't forget about business purpose • do make security the centerpiece of your strategy • don't apply the cloud to everything don't forget about Service Management • do start with a pilot project • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Text / Reference Book	Author	Publication
1	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski	John Wiley and Sons Publications, 2011
2	Brief Guide to Cloud Computing	Christopher Barnett	Constable & Robinson Limited, 2010
3	Handbook on Cloud Computing	Borivoje Furht, Armando Escalante, Springer	2010
4	Cloud Computing Theory and Practice	Dan C Marinescu, Elsevier	2013
5	Cloud Computing for Dummies	Judith Hurwitz, Robin Bloor, Marcia Kaufman & Fern Halper	Wiley Publishing, 2010

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	-	2	-	-	-	-	-	-
CO2	2	3	2	1	2	-	-	-	-	-	-	-
CO3	3	1	2	3	-	-	2	-	-	-	-	-
CO4	2	1	3	2	-	-	2	-	-	-	-	-
CO5	3	1	2	1	-	-	2	-	-	-	-	-

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	1	-	-
CO3	3	-	-
CO4	2	-	-
CO5	2	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXECE2114 **Introduction to Game Technology** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Student will able to

- Comprehend the critical importance of Game Technology
- Use learned skills to solve problems of various layouts
- Recognize what is the role each hardware component of a PC plays in games and in making games
- Conduct independent work in entertainment software engineering context.
- Work as a productive member and as part of a team developing larger entertainment software product.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Gaming Technology**	**07**
2.	**History of Gaming Hardware**	**08**
3.	**Input devices**	**08**
4.	**Functions of a GPU in games**	**07**
5.	**Role of a CPU in games**	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Gaming Technology**
	• Introduction of Unit • Basics of processes and models applied in the entertainment software industry • Basics of the game development tools • Introduction to game engines and their functions • Basics of 3D objects • Introduction to game development-related programming problem. • Basics of artificial intelligence in entertainment software engineering context. • Basics of sound engineering • Gamification and Serious games • Basic principles of AR and VR development • Conclusion of unit
2.	**History of Gaming Hardware**
	• Introduction of Unit • Console architecture over the decades • Evolution of input devices in games along with their design changes • analysis of hardware generations of consoles - with a brief overview of Gen 1-4 devices a • A broader look at some significant consoles of Gen 5-8 • Conclusion of Unit

3.	**Input devices**
	• Introduction of Unit • Types and variations of input devices (touch devices, controllers, keyboards, and mice) • How these devices work • Taking multiple types of inputs from these devices • Working on input • Adding support for these devices in your games – • challenges of building/designing an input device (ergonomics, abstraction vs immersion) • Conclusion of Unit
4.	**Functions of a GPU in games**
	• Introduction of Unit • Introduction to graphics APIs • commonly used APIs • Working of APIs in GPU Programming) • Shaders • Lighting Techniques (Ray tracing, ray-casting) • Difference between an API and an SDK • Conclusion of Unit
5.	**Role of a CPU in games**
	• Introduction of Unit • multi-threading • hyper-threading, • multi-core CPUs • parallel processing – • Need of multi-threading in games • Function of CPU in games • collision detection • pathfinding, • Realtime object tracking • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Advanced Game Development with Programmable Graphics Hardware	Alan Watt, Fabio Policarpo	April 2005	A K Peters Ltd
2.	Unity 5 Game Optimization	Chris Dickinson	Nov 2015	O' Riley Media
Reference Book				
1.	Evan Amos, 'The Game Console: A Photographic History from Atari to Xbox', No Starch Press, November 2018, ISBN 978-1593277437			
Online Resources				
2.	https://www.edx.org/learn/game-development tps://learnui.design/			
3.	https://files.eric.ed.gov/fulltext/EJ1090277.pdf			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	-	-	2	-	-	-	-	-
CO2	2	3	3	2	2	-	-	-	-	-	-	-
CO3	3	2	2	3	-	2	-	-	-	-	-	-
CO4	2	1	1	2	-	-	2	-	-	-	-	-
CO5	3	1	2	1	-	-	2	-	-	-	-	-

B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	2	-	-
CO3	3	-	-
CO4	3	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXECE2115	Digital Electronics	3 Credits [LTP: 3-0-0]

Course Outcomes: -

Students will be able to:

- Verify and interpret truth tables for all logic gates.
- Design of decoders and multiplexer.
- Use various flip-flops in digital circuits
- Apply registers and counters in digital circuits.
- Do conversion from A/D and D/A convertors.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Number System and Logic Gates	7
2.	Decoders, Multiplexers & De-Multiplexers	6
3.	Flip-Flops	7
4.	Registers And Counters	8
5.	Memories And Converters	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Number System and Logic Gates**
	• Introduction to number systems – Binary to decimal conversion – Decimal to binary conversion –Octal numbers – Hexadecimal numbers • Logic gates – NOT, OR, AND – Universal NAND and NOR gates – EX-OR and EX-NOR gates – DeMorgan's Theorems — 1's complement – 2's complement – Adders (half & full) – Subtractor (half & full). • Conclusion of the Unit
2.	**Decoders, Multiplexers & De-Multiplexers**
	• Introduction of Unit • Basic functions and block diagram of Encoders and decoders. • Basic functions and block diagram of Multiplexers and De-Multiplexers, Different types and ICs. • 4 bit decoder circuits for 7 segment display and other applications. • Conclusion of the Unit.
3.	**Flip-Flops**
	• Introduction of Unit • J-K Flip-Flop • R-S Flip-Flop • D-Type Flip-Flop • T-Type Flip-Flop • Applications of Flip-Flops • Conclusion of the Unit
4.	**Registers And Counters**
	• Introduction to Shift Register • Introduction and basic concepts including shift left and shift right. • Serial in parallel out, serial in serial out, parallel in serial out, parallel in • parallel out. • Introduction to Counters (Asynchronous and Synchronous counters) • Binary up/down counters (upto MOD-8) • Ring counter with timing diagram • Conclusion of the Unit
5.	**Memories And Converters**
	• Introduction of Unit • Memories – ROM, RAM, EPROM, EEPROM – Volatile and non-volatile – Static and dynamic RAM.

	• Analog to digital converters – Parallel Comparator A/D converter – Dual slope converter –Successive approximation method – Counter type converter. • Digital to analog converters – Binary weighted D/A converter – R/2R ladder network converter • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Digital Principles and Applications	Donald P Leach, Malvino	-	McGraw Hill
2.	Modern Digital Electronics	RP Jain	-	Tata McGraw Hill
3.	Digital Fundamentals	Floyd and Jain	-	Pearsons Education
Reference Book				
3.	Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi			
4.	Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi			
Online Resources				
3.	https://archive.nptel.ac.in/courses/108/105/108105132/			
4.	https://onlinecourses.nptel.ac.in/noc22_ee55/preview			

MAPPING OF CO VS PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXEME2116	ENGINEERING MECHANICS	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student will be able to:

CO1 Analyze the forces act on a component and method of resolution.
CO2 Evaluate centroid and center of gravity of an object and also analyze how to minimize the effort for lifting a load.
CO3 Evaluate the effect of friction and also evaluate forces with the effect of friction.
CO4 Analyze the conversion of linear motion into angular motion and vice versa.
CO5 Analyze the effect of impact on elastic and non-elastic body.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Fundamentals of Mechanics**	**8**
2.	**Machine & Moment of Inertia**	**8**
3.	**Friction & Belt Drive**	**7**
4.	**Dynamics of Particles**	**8**
5.	**Work, Power & Impact**	**8**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Fundamentals of Mechanics**
	• Introduction of Unit • Fundamental laws of mechanics, Principle of transmissibility. • System of forces, Resultant force, Resolution of force. • Moment and Couples, Varignon's Theorem, • Equilibrium, Conditions for equilibrium, Lami's theorem. • Conclusion of Unit
2.	**Machine & Moment of Inertia**
	• Introduction of Unit • Lifting Machines: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines – System of Pulleys. • Centroid & Moment of Inertia: Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section- I, L, C and H. • Conclusion of Unit
3.	**Friction & Belt Drive**
	• Introduction of Unit • Friction: Types of Friction, Laws of friction, Angle of friction, Angle of repose, Numericals on Ladder. • Belt Drive: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Length of belt, Ratio of tensions and power transmission by flat belt drives. • Conclusion of Unit
4.	**Dynamics of Particles**
	• Introduction of Unit • Kinematics of Particles and Rigid Bodies: Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular acceleration. • Kinetics of Particles and Rigid Bodies: Newton's laws, Linear Momentum, Equation of motion in rectangular coordinate, Equation of motion in plane for a rigid body, D' Alembert principle. • Conclusion of Unit
5.	**Work, Power & Impact**
	• Introduction of Unit • Work, Energy and Power: Work of a force, weight, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy. • Impact: Collision of elastic bodies, types of impact, conservation of momentum, Newton's law of collision. • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Vector Mechanics for Engineers	Beer and Johnston	Latest	Tata McGraw Hill
2.	Engineering Mechanics	D S Kumar	Latest	S K Kataria& Sons
3.	Engineering Mechanics Statics	Meriam, J. L. & Kraige, L. G	Latest	John Wiley & Son
4.	Engineering Mechanics	S. Ramamruthan	Latest	Dhanpat Rai Pub.
5.	Engineering Mechanics	Shames	Latest	Pearson Education
Important Web Links				
1.	https://nptel.ac.in/courses/112103109/			
2	https://nptel.ac.in/courses/112106286/			
3.	https://freevideolectures.com/course/2264/engineering-mechanics			

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	2	3	1	2	–	–	–	–	–	–	–	–
CO3	3	2	2	2	–	–	–	–	–	–	–	–
CO4	3	3	1	2	–	–	–	–	–	–	–	–
CO5	3	3	2	2	–	–	–	–	–	–	–	–

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	1	—	3
CO2	2	—	3
CO3	1	—	3
CO4	1	—	3
CO5	2	—	3

Code:BUACHU2204	Language Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOMES:

The students would be able to

CO 1: Identify common errors in spoken and written communication.
CO 2: Get familiarized with English vocabulary and language proficiency.
CO 3: Improve nature and style of sensible writing, acquire employment and workplace communication skills.
CO 4: Improve their Technical Communication Skills through Technical Reading and Writing practices.
CO 5: Perform well in campus recruitment, engineering and all other general competitive examinations.

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Everyday Conversations	8
2.	Asking for	7
3.	Reporting/ Describing	7
4.	Meeting People	7
5.	Expressing & Talking about	7

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Everyday Conversations**
	• Introduction to the Unit • Introducing self / others • Weather • Classroom • Asking about facilities around • Describing a person / thing • Points to cover: Vocabulary, grammar, Construction of sentences, listening • Methodology: Role plays, Videos, Classroom conversation, worksheets • Conclusion & Real Life Application
2	**Asking for**
	• Introduction to the Unit • Help/ Suggestion/ ideas • Clarification/ Directions • Time/ food • Advice • Uses • Points to cover: Vocabulary, grammar, Construction of sentences, listening • Methodology: Role plays, Videos, Classroom conversation, worksheets • Conclusion & Real-Life Application
3	**Reporting/ Describing**
	• Introduction to the Unit • Incidences • Personalities • Experiences • Wants/Needs • Intentions • Points to cover: Vocabulary, grammar, Construction of sentences, listening • Methodology: Role plays, Videos, Classroom conversation, worksheets

	• Conclusion & Real-Life Application
4	**Meeting People**
	• Introduction to the Unit • Greetings • Starting the Conversation • Small talks • Closing the conversation • Points to cover: Vocabulary, Grammar, Construction of sentences, listening • Methodology: Role plays, Videos, Classroom conversation, worksheet • Conclusion & Real-Life Application
5	**Expressing & Talking about**
	• Introduction to the Unit • Happiness/Displeasure • Preferences • Doubts • Views • Unawareness • Points to cover: Vocabulary, grammar, Construction of sentences, listening • Methodology: Role plays, Videos, Classroom conversation, worksheets Interests • Different Cultures, Clothes, cars, institutes, situations • Schedules, prices • Points to cover: Vocabulary, grammar, Construction of sentences, listening Methodology: Role plays, Videos, Classroom conversation, worksheets • Conclusion & Real-Life Application

C: **Recommanded Study Material**

Sr. No	Reference Book	Author	Publication
1.	Speak Now Level I & II	Jack C Richards & David Bohlke	Oxford Press
2.	Business Benchmark, Level –	Guy Brook-Hart	Upper Intermediate by Cambridge University Press
3.	Practical English Usage	Michel Swan	Oxford University Press
4.	Cambridge Grammar for English: A comprehensive Guide for spoken & written English	Ronald Carter, Michael McCarthy	(South Asian edition), Cambridge University Press

Code:BULCSE2201	Skill Enhancement Generic Course-II	1 Credits [LTP: 0-0-2]

COURSE OUTCOMES: On completion of the course a student will be able to:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

LIST OF ACTIVITIES	
1	Types of Interviews, Interview Practice
2	Time & Work, Syllogisms
3	Critical Reasoning
4	Mensuration, Cubes & Dices
5	Para Jumble, Permutations & Combinations
6	Blood Relations & Direction Sense, Manners & Etiquette
7	Idiom & Phrases, Prefix-Suffix
8	Probability. Puzzles
9	Data Sufficiency, Logical Choices & Connectives
10	Date Interpretations, Deductions
11	Essay Writing, E-mail Writing
12	Personal Grooming

Code:BUVCPH2102	Health Behavior in Communication	2 Credits [LTP: 2-0-0]

COURSE OUTCOME

The student would be able to:

CO1: Demonstrate an understanding of behavior change theories that are often used in health contexts.
CO2: Effectively evaluate existing health communication campaigns that use behavior change theories
CO3: Evaluation of health communication campaigns.
CO4: Understand how to use behavior change theories in the construction and
CO5: Develop and enhance research skills and critical thinking.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Behavior Change**	**04**
2	**Social Marketing, Cognitive Theory, and Norms**	**05**
3	**Integrated Models of Health Communication & Behavior Change**	**05**
4	**Digital Health Communication**	**05**
5	**Health Communication and Social Responsibility**	**05**

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Behavior Change**
	• Introduction of the Unit • Introduction to Course, Health Communication and Behavior Change • Introduction to Behavior Change Theories • Upstream/Downstream Behavior Change and Social Determinants of Health • Conclusion of the unit
2	**Social Marketing, Cognitive Theory, and Norms**
	• Introduction of the Unit • Social Marketing • Social Cognitive Theory • Social Norms • Conclusion of the unit
3	**Integrated Models of Health Communication & Behavior Change**
	• Introduction of the Unit • Integrated Model of Behavioral Prediction • Stages of Change • Health Belief Model • Conclusion of the unit
4	**Digital Health Communication**
	• Introduction of the Unit • eHealth • mHealth • Social Media and Health Communication • Conclusion of the unit
5	**Health Communication and Social Responsibility**
	• Introduction of the Unit • Health, Cause Marketing, and Corporate Social Responsibility • Entertainment Media and Health • Unintended Effects of Health Messages

	Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1	The role of theory in developing effective health communications,	Fishbein, M. & Capella, J.N.	2006	Journal of Communication, S1-S17. Dhanpat Rai
2	The effectiveness of social marketing interventions for health improvement: What's the evidence?	Gordon, R., McDermott, L., Stead, M., Angus, K.	2006	Public Health, 1133-1139.
3	Using the Integrative Model to explain how exposure to sexual media content influences adolescent sexual behavior.	Bleakley, A., Hennessy, M., Fishbein, M & Jordan, A.	2011 Latest	Health Education & Behavior, 530-540.
4	New directions in eHealth communication: Opportunities & challenges.	Kreps, G.L. & Neuhauser, L.	2010	Patient Education and Counseling, 329-336.
5	To do well by doing good: Improving corporate image through cause-related marketing.	Vanhamme, J., Lindgreen, A., Reast, J., van Popering, N.	2012	Journal of Business Ethics, 259-274

III SEMESTER

Major Courses

Code :BCECCE3101 Introduction to Web Technology 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Create an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Apply HTML & CSS to solve real time web problems.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to HTML And Internet**	8
2.	**HTML& CSS**	8
3.	**HTML5, CSS3**	8
4.	**XML**	6
5.	**Practical Website Development**	6

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to HTML And Internet**
	• Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP,TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture • Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development. • HTML, CSS, JS, XML; HTTP, secure HTTP, etc; URL, Web Services – SOAP, REST • Conclusion of the Unit
2.	**HTML & CSS**
	• Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; • More HTML Tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button, Images. • Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Inline styles, External and Internal Style Sheets, Borders & boxing • Conclusion of the Unit
3.	**HTML5, CSS3**
	• Introduction to HTML5. • Introduction to CSS3, New features, Local storage, Web Sockets, Server events, Canvas, • Audio & Video, Geo location, Micro data, Drag and Drop. Browser life cycle and browser rendering stages. Service workers • Conclusion of the Unit
4.	**XML**
	• Introduction to XML • Difference b/w Html & XML, XML editors. • XML Elements & Attributes XML DTD. • XML Schema, XML Parser. • Document Object Model (DOM), XML DOM. • Conclusion of the Unit
5.	**Practical web site development**
	• Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures, • Web authoring tools, Web hosting, website maintenance, generating traffic to your website.

	• Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Practical Web Design for Absolute Beginners	AdrianW. West	2016	Apress 2016
2.	Introducing Web Development	Jorg Krause	2017	Apress 2017
Reference Book				
3.	HTML and CSS: Design and Build Websites – by Jon Duckett			
4.	Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages – by Elisabeth Robson & Eric Freeman Publisher- ORELLY			
Online Resources				
6.	https://www.w3schools.com/html/html_links.asp			

Code: BCECCE3102	DATA STRUCTURE AND ALGORITHMS	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyse running times of algorithms using asymptotic analysis.
- Analyse time complexities of various searching, sorting.
- Create various applications using stack, queue, tree and graph.
- Able to select relevant data structure to solve the problem.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Data structures**	**8**
2.	**Searching and Sorting**	**8**
3.	**Stack and Queue**	**8**
4.	**Linked List**	**9**
5.	**Tree Graphs and their Applications**	**7**

D. Detailed Syllabus

Unit	Unit Details
1.	**Introduction to Data structures**
	• Introduction to Unit • Definition, • Classification of data structures: primitive and non-primitive • Elementary data organization • Time and space complexity of an algorithm (Examples), String processing. • Definition of dynamic memory allocation • Accessing the address of a variable • Declaring and initializing pointers - • Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). • Recursion – Definition, advantages, Writing Recursive programs – Binomial coefficient, Fibonacci, GCD. • Conclusion and Real Life Applications of unit
2.	**Searching and Sorting**
	• Introduction to Unit • Basic Search Techniques - Sequential search, Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. • Sorting: General back ground and definition- Bubblesort,Selectionsort,Insertionsort,Mergesort,Quicksort • Conclusion and Real Life Applications of unit
3.	**Stack and Queue**
	• Introduction to Unit • Stack – Definition • Array representation of stack • Operations on stack: Infix, prefix and postfix notations • Conversion of an arithmetic expression from Infix to postfix • Applications of stacks. • Definition of queue • Array representation of queue • Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue, • Operations on all types of Queues • Conclusion and Real Life Applications of Unit
4.	**Linked List**
	• Introduction of Unit • Definition of linked list • Components of linked list • Representation of linked list • Advantages and Disadvantages of linked list • Types of linked list: Singly linked list, doubly linked list, Circular linked list • Operations on singly linked list: creation, insertion, deletion, search and display • Conclusion and Real Life Applications of Unit
5.	**Tree Graphs and their Applications**
	• Introduction to Unit • Definition : Tree

	• Binary tree, Complete binary tree, Binary search tree • Heap • Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node • Binary tree: Array representation of tree, Creation of binary tree. • Traversal of Binary Tree: Preorder, Inorder and postorder. • Graphs • Application of Graphs • Depth First search, Breadth First search. • Conclusion and Real Life Applications of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Schaum's outline series Data structures	Lips chutz	Latest	TMH.
2.	Data Structures and program designing using 'C'	Robert Kruse	Latest	Pearson Education
Reference Book				
1.	Introduction to Data Structures in C by- Kamthane Pearson Education2005			
2.	Data Structures Using C by- Bandyo Padhyay Pearson Education			
Online Resources				
1.	https://www.gatevidyalay.com/data-structures/			
2.	https://www.youtube.com/watch?v=QBrDsG3MTkw			
3.	https://www.tutorialspoint.com/data_structures_algorithms/index.htm			

Code: BCECCE3103 **Operating System** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Know structure and organization of the file system.
- Get concept what a process is and how processes are synchronized and scheduled.
- Acquire different approaches to memory management.
- Use system calls for managing processes, memory and the file system.
- Know the data structures and algorithms used to implement an OS.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Operating System Overview**	**08**
2.	**Process Management**	**08**
3.	**Process Deadlocks**	**08**
4.	**Memory Management**	**09**
5.	**File Management**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Operating System Overview**
	• Introduction of Unit • Definition, Two views of operating system, Evolution of operating system, Types of OS. • System Call, Handling System Calls, System Programs, Operating System Structures, • The Shell, Open Source Operating Systems • Conclusion of Unit
2.	**Process Management**
	• Introduction of Unit • Process v/s Program, Multi-programming, Process Model, Process States, Process Control Block. • Threads, Thread v/s Process, User and Kernel Space Threads. • Inter Process Communication, Race Condition, Critical Section • Implementing Mutual Exclusion: Mutual Exclusion with Busy Waiting • Interrupts, Lock Variables, Strict Alteration, Peterson's Solution, Test and Set Lock. • Sleep and Wake-up, Semaphore, Monitors, Message Passing. • Classical IPC problems: Producer Consumer, Sleeping Barber, Dining Philosopher • Problem • Process Scheduling: Goals, Batch System Scheduling (First-Come First-Served, Shortest Job First, Shortest Remaining Time Next), Interactive System Scheduling (Round-Robin Scheduling, Priority Scheduling, Multiple Queues), Overview of Real Time System Scheduling • Conclusion of Unit
3.	**Process Deadlocks**
	• Introduction of Unit • Introduction, Deadlock Characterization, Preempt able and Non-preempt able Resources • Resource – Allocation Graph, Conditions for Deadlock. • Handling Deadlocks: Ostrich Algorithm, Deadlock prevention, Deadlock Avoidance. • Deadlock Detection (For Single and Multiple Resource Instances), Recovery From • Deadlock (Through Preemption and Rollback) • Conclusion of Unit
4.	**Memory Management**
	• Introduction of Unit • Introduction, Mono programming vs. Multi-programming, Modeling Multiprogramming, Multiprogramming with fixed and variable partitions, Relocation and Protection. • Memory management (Bitmaps & Linked-list), Memory Allocation Strategies • Virtual memory: Paging, Page Table, Page Table Structure, Handling Page Faults, TLB's • Page Replacement Algorithms: FIFO, Second Chance, LRU, Optimal, LFU, Clock, WS- Clock, Concept of Locality of Reference, Belady's Anomaly • Segmentation: Need of Segmentation, its Drawbacks, Segmentation with Paging(MULTICS) • Conclusion of Unit
5.	**File Management**
	• Introduction of Unit • File Overview: File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Single Level, two Level and Hierarchical Directory Systems, File System Layout. • Implementing Files: Contiguous allocation, Linked List Allocation, Linked List • Allocation using Table in Memory, Inodes.

	• Directory Operations, Path Names, Directory Implementation, Shared Files • Free Space Management: Bitmaps, Linked List • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Operating system concepts	Silberschatz, Galvin, Gagne	8th edition	John Wiley and Sons
2.	Modern Operating System	A.S.Tanenbaum	2nd Edition	Pearson
Reference Book				
1.	**"**Head First Java" by Kathy Sierra			
Online Resources				
1.	https://www.coursera.org/courses?query=operating%20system			
2.	https://onecompiler.com/java			

Practical

Code : BCECCE3201	Web Technology Lab	1 Credits [LTP: 0-0-2]

Course Outcome: -
Students will be able to:

- Apply the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Evaluate how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.

A. **LIST OF EXPERIMENTS**

1	Hello World Web Page (a) Create a web page using basic HTML features like tags, attributes, elements and page title (b)How to install and configure a web server
2	Create a My Profile Page (a) Using text boxes, check boxes, radio buttons and submit buttons. (b) Design a web page using CSS include the following: 1. Control the repetition of image with back ground-repeat property. 2. Define style for links asa: link, b:active,c:hover,d:visited. 3. Add customized cursors for links.
3	Create a My Profile Page (a) A more functional web page by making use of headings, paragraphs, lists, images and links. (b) Design a web page using CSS include the following: 1. Use different font styles. 2. Set back ground image for both the page and single elements on the page.
4	Create XML Http Request and retrieve data from a text file and an XML file.
5	Create the following webpage: (a) Show the class time table in a tabular format. (b) Create a web page using HTML to show your geolocation.
6	Create a webpage using HTML for audio and video player.
7	Create a log in registration form using PHP.
8	Develop a PHP web page to manipulating files such as creating ,writing, reading and uploading.
9	Create a dynamic web page by using PHP conditional operators, loops and strings to create an dynamic time table page.
10	Develop a PHPweb application track the user as how many times visited and last visited time
11	Develop a static website–I.
12	Develop a static website–II.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Practical Web Design for Absolute Beginners	AdrianW. West	2016	Apress 2016
2.	Introducing Web Development	Jorg Krause	2017	Apress2017
3.	HTML & CSS: The Complete Reference	Thomas Powell	2010, FifthEdition	McGrawHill,
Reference Book				
1.	HTML and CSS: Design and Build Websites – by Jon Duckett			
2.	Head First HTML and CSS: A Learner‘s Guide to Creating Standards-Based Web Pages – by Elisabeth Robson & Eric Freeman Publisher- ORELLY			
Online Resources				
1.	https://www.w3schools.com/html/html_links.asp			
2.	https://www.tutorialrepublic.com/html-tutorial/html-links.php			

Code : BCECCE3202 **Data Structures and Algorithms Lab** **1 Credits [LTP: 0-0-2]**

COURSE OUTCOME

Students will be able to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyse running times of algorithms using asymptotic analysis.
- Implement various searching, sorting.
- Create various applications using stack , queue, tree and graph.
- Implement relevant data structure to solve the real world problem.

A. **LIST OF EXPERIMENTS**

1	Use a recursive function to find a) GCD of two numbers. b) Use a recursive function to find the Fibonacci series. c) Factorial d) Binomial Coefficient
2	Perform the following: a) Insert an integer into a given position in an array. b) Deleting an integer from an array.
3	Perform the following: a) Write a program for linear search b) Write a program for Binary search c) Write a program to sort N numbers using bubble sort.
4	Perform the following: a) Write a program to sort N numbers using insertion sort. b) Write a program to sort N numbers using selection sort. c) Write a program to sort N numbers using bubble sort.
5	Write a program to sort N numbers using quick sort.
6	Write a program to sort N numbers using merge sort.
7	Write a C program to create Stack using array.
8	Write a C program to create queue using array.
9	Write a program to create a linked list and to display it.
10	Inserting a node into a singly linked list on various position beginning, after given location and end.
11	Deleting a node into a singly linked list on various position beginning, after given location and end.
12	Write a C program to create stack and queue using linked list.
13	Creating a binary search tree and traversing it using inorder, preorder and postorder.
14	Write a C program to implement graph.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Structures and Algorithm Analysis in C	Weiss	2001	Pearson Education
2.	Schaum's outline series Data structures	Lipschutz		Tata McGraw-Hill
3.	Data Structures and program designing using 'C'	Robert Kruse		Pearson
4.	Data Structures Using C	Bandyopadhyay	1999	Pearson Education
Reference Book				
5.	Data Structures Using C, Pearson Education, Tenenbaum.			
6.	Introduction to Data Structures in C, Pearson Education 2005, Kamthane			
7.	Data Structures using C and C++, Pearson Education, Langsam, Ausenstein Maoshe & M. Tanenbaum Aaron.			
Online Resources				
8.	https://www.programiz.com/dsa			
9.	https://www.geeksforgeeks.org/data-structures/			
10.	https://www.codechef.com/certification/data-structures-and-algorithms/prepare			

Code: BCECCE3203	Linux Operating System Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Implement basic services and functionalities of the operating system using system calls.
- Use modern operating system calls and synchronization libraries in software/ hardware interfaces.
- Know the benefits of thread over process and implement synchronized programs using multi-threading concepts.
- Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
- Implement memory management schemes and page replacement schemes.

A. LIST OF EXPERIMENTS:

1.	Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin d) Priority
2.	Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed c) Linked
3.	Write a C program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue
4.	Write a C program to simulate the MVT and MFT memory management techniques.
5.	Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit
6.	Write a C program to simulate paging technique of memory management
7.	Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.
8.	Write a C program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN
9.	Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU
10.	Write a C program to simulate page replacement algorithms
11.	Write a C program to simulate producer-consumer problem using semaphores.
12.	Write a C program to simulate the concept of Dining-Philosophers problem.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Operating system concepts	Silberschatz, Galvin, Gagne	8th edition	John Wiley and Sons
2.	Modern Operating System	A.S.Tanenbaum	Second Edition	Pearson
Reference Book				
3.	Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016			
Online Resources				
4.	*https://www.coursera.org › courses › query=operating s...*			
5.	*https://www.javatpoint.com › best-courses-for-the-oper...*			
6.	*https://hackr.io › tutorials › learn-operating-systems*			

Code: BCECCE3204 **Office Automation Lab** **1 Credits [LTP: 0-0-2]**

Course Outcome: -

Students will be able to:

- Prepare document in MS word using pictures and editing properly.
- Construct forms in MS. Word
- Protect a document from unauthorized access by assigning password
- Prepare worksheet to keep records and how to use mathematical formula in same
- Present a Presentation using MS Power point

A. LIST OF EXPERIMENTS:

1	**MS Word** Prepare a document about any tourist destination of your choice with appropriate pictures and editing features.
2	Prepare a News Paper Layout. Insert appropriate pictures wherever necessary. Use the following Features: (a) Three Column and Four Column setting (b) Set One or Two Advertisements (c) Use Bullets and Numbering.
3	Create a Document consisting of Bio-data. It includes (a) A table giving your qualification and /or experience of work. Table should be Bordered and Shaded. (b) A Multilevel list giving your areas of interest and further areas of interest. The sub areas should be numbered as 'a','b', etc while the area should be numbered as '1','2',etc. (c) The information should be divided in ―General‖ and ―Academic‖ sections. The header should contain ―BIO-DATA ‖while the footer should have page numbers in the format Page1of 10. (d) Assign a password for the document to protect it from unauthorized access.
4	Assume that you are coordinating a seminar in your organization. Write a letter to 10 different IT companies asking them to participate in the seminar using mail merge facility.
5	Prepare a document which contains template of marks card of students. Assume that there are 10 students. The footer for the document should be 'Poornima University Jaipur'.
6	Prepare a document about any topic In mathematics which uses mathematical symbols. (At least 5 mathematical symbols should be used). Assign a password for the document to protect it from unauthorized access. Demonstrate the use of Hyperlink Option. Sets margins to your document, a font of size and double spaced document
7	**MS-Excel** Open a new work book, save it as JavaCoffeeBar.xls. In sheet 1 write following sales data for JavaCoffee bar to show their first 6 months sales. (a) Select cell B4:D4 and change the horizontal alignment to center and text to 90degree. (b) All titles should be in bold (c) Format all cells numbers to currency style and adjust width as necessary. (d) Add border to data.

8	Prepare a worksheet to maintain student information. The work sheet should Contain Roll Number, Name and marks in 5 subjects. (Max Marks is 100).Validate the marks. Calculate the total marks. Assign the grade according to the following. Assign grade 'A' if the total marks is above 450. From 401 to 449 assign the grade as 'B'. From 351 to 400 assign the Grade as 'C'. From 300 to 350 the grade to be assigned is 'D'. For the total marks less than 300 No grade is assigned. A student is eligible to get a grade only when he gets 40 and above in all the subjects. In such cases the grade is―FAIL‖.(Assume that there are 10 students)
9	Prepare a pay-bill using a worksheet. The work sheet should contain Employee Id, Name ,Designation,
	Experience and Basic Salary and Job ID. If Job Id is 1 then DA is 40% of the basic salary. HRA is Rs. 4500. If Job Id is 2 then DA is 35% of the basic salary. HRA is Rs.3500. If Job Id is 3 then DA is 30% of the basic salary. HRA is Rs. 2500. If Job Id is 4 then DA is 25% of the basic salary and HRA is RS.2500. For all the other Job ids DA is 20% of the basic salary and HRA is Rs. 1500. For all the above Job ids PF to be deducted is 4%. For the job ids between1-4 Rs.100 to be deducted as Professional Tax. Find the netpay.
10	For the above employee worksheet perform the following operations (a) Use filter to display the details of employees whose salary is greater than 10,000. (b) Sort the employees on the basis of their net pay (c) Use advance filter to display the details of employees whose designation is "Programmer‖ and Net Pay is greater than 20,000 with experience greater than 2yrs
11	Using Excel project the Products ales for any five products for five years. Compute the total sales of each product in the five years. Compute the total sales of all the products in five year. Compute the total sales of all products for each year. Represent annual sale of all the products using Pie-Chart. Represent annual sales of all products using Bar Chart. Represent sale of a product for five years using Pie-Chart. Label and format the graphs
12	Create a statement of Telephone Bill Charge for a customer. Telephone Calls Up to150calls- free 151to500calls-0.80percall 501 to1000calls-1.00percall 1001to2000-1.25percall Above2000- 1.40percall
13	Perform Following: (a) Using Excel write sales data with columns product, month and sales. Write at least 5 records. Create Pivot Table chart and Report for the data. (b) Create a macro to change the name of worksheet as Macro Example, merge first three columns of first row and write heading as DATA in green color with yellow background. (c) Link word document in excel worksheet to show the usage of linking and embedding.
14	MS Power Point Assume that you are going to give a presentation about Information Technology. (Choose some latest technologies). The presentation should have minimum 10 slides. Insert appropriate images wherever necessary. Use proper formatting, Diagrams and tables. Show the usage of action buttons, hyperlinks, and animations.

DEPARTMENT ELECTIVE

Code: BCEECE03111 **Software Engineering** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

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

- Analyze software process models including traditional and evolutionary models
- Design applicable solutions in one or more application domains using software design methods that integrate planning and design process
- Draw UML diagram using basic behavioral modeling and advanced structured modeling
- Deliver quality software products by possessing the effective analytical skills by applying the testing processes
- Apply new software models, techniques and technologies to design a software project for the growth of the society

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	2	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Software Engineering Fundamentals**	**07**
2.	**Software Project Planning**	**08**
3.	**Software Design and UML**	**08**
4.	**Software Testing**	**07**
5.	**AGILE Project Management**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Software Engineering Fundamentals**
	• Introduction of Unit • Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms • Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model • Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques. • Conclusion of Unit
2.	**Software Project Planning**
	• Introduction of Unit • Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, • Risk Identification and Projection: RMMM, Project scheduling and Tracking. • Software Design Process, Design Principles, and Design Concepts: Effective Modular Design, Design Heuristics, Design Documentation, • Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project. • Conclusion of Unit
3.	**Software Design and UML**
	• Introduction of Unit • Unified Modeling Language, Basic structures and modeling classes, common modeling techniques, relationships, common mechanism, class diagrams. • Advanced structured modeling, advanced classes and relationships, interfaces, types and roles, instances and object diagram. • Basic behavioral Modeling: Use cases, use case diagrams, Interaction diagram, Activity diagrams, state chart diagrams, component diagrams, deployment diagrams, patterns and frame works. • Conclusion of Unit
4.	**Software Testing**
	• Introduction of Unit • S/W Testing Fundamentals, Unit, integration, system testing, black box and white box testing Incremental testing, formal proof of correctness, software matrix • Automated Testing: Introduction to Automated testing, Software testing with automated tools • Conclusion of Unit
5.	**AGILE Project Management**
	• Introduction of Unit • Agile Programming- Introduction, Flavors of Agile Development, Agile Manifesto, Refactoring Techniques, Limitations of the Agile Process. • Agile Modeling: Introduction, Agile Modeling – Principles, Comparing Waterfall and Agile Modeling • Scrum Methodology- The roles of Scrum, Project Artifacts, Meetings, Advantages of Scrum. • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Software Engineering: A Practitioner‟s Approach	Roger S Pressman, Bruce R Maxim	8th Edition	TMH.
2.	Software engineering	Ian Sommerville	9th Edition	Addison Wesley Longman
Reference Book				
1.	Grady Booch, James Rumbaugh, IvarJacobson.,” The Unified Modeling Language User Guide”, 2nd Edition, 2017			
2.	James Rumbaugh. MichealBlaha “Object oriented Modeling and Design with UML”, 2011			
3.	Ali Behforooz, Hudson, “Software Engineering Fundamentals”, Oxford, 2009			
4.	Charles Ritcher, “Designing Flexible Object Oriented systems with UML”, TechMedia , 2008			
Online Resources				
1.	https://nptel.ac.in/courses/106105182			
2.	https://www.w3schools.in/sdlc/software-development-life-cycle-sdlc			

Code: BCEECE03112	SAS Programming in VIYA	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

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

- Connect to Cloud Analytic Services (CAS). Access and use caslibs.
- Load SAS data sets, CSV files, and Microsoft Excel files into CAS. Save SASHDAT files.
- Modify Base SAS programs to execute in CAS.
- Modify SQL procedure code to execute in CAS using FedSQL.
- Use CAS-enabled functions and procedures

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	2	2	1	3	—	—	—	—	—	—	—	—
CO-3	2	3	2	2	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	1	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	-	2	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	SAS Viya Platform Overview	07
2.	Managing Data in SAS Cloud Analytic Services	08
3.	Running SAS Procedures in SAS Cloud Analytic Services (CAS)	07
4.	Modifying SQL Code to Run in SAS Cloud Analytic Services (CAS)	08
5.	Using the Native CAS Language (CASL)	07

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**SAS Viya Platform Overview**
	• Introducing the SAS Viya platform. • SAS Viya programming interfaces. • SAS Viya servers and processing environments • Overview of running SAS code on the SAS Compute Server. • SAS Viya Compute Server overview. • Running SAS 9 Code on the Compute Server in SAS Viya. • CAS fundamentals. • Understanding caslibs.
2.	**Managing Data in SAS Cloud Analytic Services**
	• Introduction of Unit • Loading data to in-memory tables. • Accessing DBMS data. • Saving and dropping in-memory tables • Modifying DATA step code to run in SAS Cloud Analytic Services (CAS) • .Conclusion of Unit
3.	**Running SAS Procedures in SAS Cloud Analytic Services (CAS)**
	• Introduction of Unit • Introduction to SAS procedures in SAS Viya. • Running CAS-enabled SAS procedures. • Conclusion of Unit
4.	**Modifying SQL Code to Run in SAS Cloud Analytic Services (CAS)**
	• Introduction of Unit • Modifying SQL code to run in CAS. • Column data types in CAS. • Conclusion of Unit
5.	**Using the Native CAS Language (CASL)**
	• Introduction to CASL. • Using CAS actions.

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	The Little SAS Enterprise Guide Book	Susan Slaughter & Lora Delwiche	Latest	SAS
2	SAS Certification Prep Guide		3rd	SAS Institute
Reference Book				

1	Learn SAS By example A Programmer Guide By Ron Cody
Online Resources	
1	https://www.sas.com/de_de/training/courses/learning-formats/e-learning.html

Code: BCEECE03121	Theory Of Computation	3 Credits [LTP: 3-0-0]

COURSE OUTCOME
Students will be able to:

- Use the concepts and techniques of discrete mathematics for theoretical computer science.
- Identify different formal languages and their relationship.
- Classify and construct grammars for different languages and vice-versa.
- Build finite automata, push down automata and Turing machine.
- Analyze various concepts of undecidability and Computable Function
- Discuss analytically and intuitively for problem-solving situation.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	2	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	2	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Review of Mathematical Theory	07
2.	Regular Languages and Finite Automata	08
3.	Context free grammar (CFG)	08
4.	Pushdown Automata, CFL And NCFL	07
5.	Turing Machine (TM)	07

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Review of Mathematical Theory**
	• Introduction of Unit • Sets, Functions, Logical statements, Proofs, Relations, • Languages, Principal of Mathematical Induction, • Strong Principle, Recursive Definitions, • Structural Induction. • Conclusion of Unit
2.	**Regular Languages and Finite Automata**
	• Introduction of Unit • Regular Expressions, Regular Languages, Application of Finite Automata, • Automata with output - Moore machine & Mealy machine, • Finite Automata, Memory requirement in a recognizer, • Definitions, union- intersection and complement of regular languages, Non Deterministic Finite Automata, • Conversion from NFA to FA, Non Deterministic Finite Automata, Conversion of NFA to NFA • Kleene's Theorem, Minimization of Finite automata, Regular And Non Regular Languages – pumping lemma. • Conclusion of Unit
3.	**Context free grammar (CFG)**
	• Introduction of Unit • Definitions and Examples, Unions Concatenations And Kleene's of Context free language, • Regular Grammar for Regular Language, Derivations and Ambiguity , • Unambiguous CFG and Algebraic Expressions, BacosNaur Form (BNF), Normal Form – CNF. • Conclusion of Unit
4.	**Pushdown Automata, CFL And NCFL**
	• Introduction of Unit • Definitions, Deterministic PDA, Equivalence of CFG and PDA & Conversion, • Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL. • Conclusion of Unit
5.	**Turing Machine (TM)**
	• Introduction of Unit • TM Definition, Model Of Computation, • Turing Machine as Language Acceptor, • TM that Compute Partial Function, Church Turning Thesis, • Combining TM, Variations Of TM, Non Deterministic TM, Universal TM, • Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy. • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Theory of Computer Science: Automata, Languages and Computation	Mishra & Chandrashekhar	3rd	PHI
2.	An Introduction to Formal Languages and Automata	Peter Linz	6th	Mass Market Paperback
Reference Book				
3.	Introduction to Languages and the Theory of Computation, 4th by John Martin, Tata Mc Graw Hill			
4.	Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc			
5.	Compiler Design By Alfred V Aho, Addison Weslley			
Online Resources				
4.	http://en.wikipedia.org/wiki/Theory_of_computation			
5.	http://meru.cecs.missouri.edu/courses/cecs341/tc.html			
6.	https://www.geeksforgeeks.org/introduction-of-theory-of-computation/			

Code : BCEECE03122 Statistical Foundation of data Science 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Apply the skills of data preprocessing.
- Identify the relationship between data dependencies using statistics
- Implement machine learning techniques to data science applications.
- Apply various data visualization tools to Data.
- Apply suitable tools for the real world Data Science applications

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction to Data science	06
2.	Describing Data	08
3.	Machine Learning	08
4.	Data Visualizations	07
5.	Computing for Data Science	07

D. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to Data science**
	• Introduction of Unit • Definition of Data science • Need for data science • Benefits and uses • Facets of data • Data science process • Conclusion of the unit
2	**Describing Data**
	• Introduction of Unit • Frequency distributions • Outliers • Relative frequency distributions • Cumulative frequency distributions • Frequency distributions for nominal data • Interpreting distributions :graphs, averages, mode, median, mean • Averages for qualitative and ranked data • Describing variability : range, variance, standard deviation, degrees of freedom, interquartile range variability for qualitative and ranked data • Conclusion of the unit
3	**Machine Learning**
	• Introduction of Unit • Machine learning techniques • Regression Pearson's r value • Clustering • k-means algorithm • Classification • Types of classification algorithms • Decision tree classification • Conclusion of the unit
4	**Data Visualizations**

	• Introduction of Unit • Data Visualizations • The Big Three • Picking the Most Appropriate Design Style • Selecting the Appropriate Data Graphic Type • Web-Based Applications for Visualization Design • Designing Data Visualizations for Collaboration • Visualizing Spatial Data with Online Geographic Tools. • Conclusion of the unit
5	**Computing for Data Science**
	• Introduction of Unit • Using Python for Data Science • Sorting Out the Python Data Types • Putting Loops to Good use in Python • Basics of Numpy arrays in Python • Data manipulation with Pandas • Using Open Source R for Data Science • R's Basic Vocabulary • Delving into Functions and Operators • Doing Data Science with Excel • Making Life Easier with Excel. • Conclusion of the unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Introducing Data Science	David Cielen, Arno D. B. Meysman, and Mohamed Ali	Fourth Edition	Manning
2.	Statistics	Robert S. Witte and John S. Witte	Eleventh Edition	Wiley
3.	Python Data Science Handbook	Jake Vander Plas		O'Reilly
4.	Data Science for Dummies	Lillian Pierson	Second Edition	John Wiley & Sons publications, 2017
Reference Book				
1.	Think Stats: Exploratory Data Analysis in Python, Green Tea Press, Allen B. Downey.			

Online Resources	
1.	https://www.edx.org/learn/data-science
2.	https://www.udemy.com/courses/development/data-science
3.	https://www.coursera.org/browse/data-science

Code :BCEECE03123	Analytics Programming Fundamental	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Student will able to

- Understand the fundamental concepts of analytics and programming languages commonly used in data analysis.
- Acquire skills in collecting, cleaning, and preprocessing data from various sources for analysis.
- Gain proficiency in exploratory data analysis, data visualization, and summarizing data patterns
- Develop the ability to perform statistical analysis, hypothesis testing, and interpret statistical results for data-driven decision-making.
- Build a foundation in machine learning, including training and evaluating machine learning models for predictive analytics tasks.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. **OUTLINE OF THE COURSE**

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Analytics and Programming Basics**	**07**
2.	**Data Collection and Preprocessing**	**08**
3.	**Exploratory Data Analysis (EDA)**	**08**
4.	**Statistical Analysis and Hypothesis Testing**	**07**
5.	**Machine Learning Fundamentals**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Analytics and Programming Basics**
	• Introduction of Unit • Introduction to analytics, data science, and their applications • Overview of programming languages commonly used in analytics (Python, R, etc.) • Basic concepts of programming: variables, data types, operators, and control structures • Introduction to data manipulation and analysis libraries (e.g., Pandas, NumPy) • Conclusion of Unit
2.	**Data Collection and Preprocessing**
	• Introduction of Unit • Data collection methods: web scraping, APIs, databases, etc. • Data cleaning and preprocessing techniques • Handling missing data and data imputation • Data transformation and feature engineering • Conclusion of Unit
3.	**Exploratory Data Analysis (EDA)**
	• Introduction of Unit • Introduction to EDA and its importance in data analysis • Data visualization using libraries like Matplotlib and Seaborn • Descriptive statistics and data summarization • Identifying patterns, trends, and outliers in the data • Conclusion of Unit
4.	**Statistical Analysis and Hypothesis Testing**
	• Introduction of Unit • Foundations of statistical analysis: probability, distributions, and hypothesis testing • Performing hypothesis tests for means, proportions, and correlations • Interpreting and drawing conclusions from statistical results • Implementing statistical tests using libraries like SciPy and Statsmodels • Conclusion of Unit
5.	**Machine Learning Fundamentals**
	• Introduction of Unit • Introduction to machine learning and its types (supervised, unsupervised, etc.) • Training and evaluation of machine learning models • Classic machine learning algorithms: linear regression, logistic regression, decision trees, etc. • Introduction to model evaluation metrics (accuracy, precision, recall, etc.) • Conclusion of Unit

E. **RECOMMENDED STUDY MATERIAL**

S. No	Text Books:	Author	Edition	Publication
1.	"Python for Data Analysis"	Wes McKinney	2nd	O'Reilly Media
2.	"Introduction to Statistical Learning: with Applications in R"	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	1st	Springer
Reference Book				
1.	“Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost, Tom Fawcett O'Reilly Media			

Code :BCEECE03124	Cyber Crime Law and IPR	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Student will able to

- Get the knowledge about cyber crime and get awareness about cyber crime
- Differentiate the cyber crime and the provision for it
- Know about the cyber crime act law and the rules about copy right
- Get the knowledge about computer forensic and its requirement.
- Learn about the Indian cyber laws and its usage

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Cyber Crime Introduction**	**07**
2.	**Indian Cyber Laws-I**	**08**
3.	**Indian Cyber Laws-II**	**08**
4.	**Computer Forensics**	**07**
5.	**Copyright and Cyber law**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Cyber Crime Introduction**
	• Introduction of Unit • Cyber Crime Introduction (Need for cyber law, Evolution of key terms and concepts) • Cyber Crime Introduction (Cyber Crimes and Jurisprudence of Cyber Law, What is cyber law and IPRs, Need for cyber law, Evolution of key terms and concepts • Need for cyber law, Evolution of key terms and concepts, Cyber Crimes and Jurisprudence of Cyber Law, What is cyber law and IPRs • Introduction of IT Act, Introduction Conventional Crime ,Cyber Crime,Reasons for Cyber Crime • Classification of Conventional and Cyber Crime, Difference between Conventional and Unconventional Cyber Crime • Cyber Criminal Mode and Manner of Committing Cyber Crime, Computer crime prevention measures • Conclusion of Unit
2.	**Indian Cyber Laws-I**
	• Introduction of Unit • Provisions in Indian Laws in dealing with Cyber Crimes and its critical analysis, Information Technology Act, 2000, Penalties and Offences under IT Act • Offences related with Digital Signature and Electronic Signature under IT Act, Statutory Provisions • Establishment of Authorities under IT Act and their functions, powers such as Controller, Certifying Authorities ,Cyber Regulation Appellate Tribunal, Adjudicating officer • Conclusion of Unit
3.	**Indian Cyber Laws-II**
	• Introduction of Unit • International Organizations and their roles such as ICANN,URDP,WTO and TRIPS • Evolution of IT Act ,Digital/ Electronic Signature- Analysis in the background of Indian Laws • E-Commerce; Issues and provisions in Indian Law • EGovernance; concept and practicality in India, ETaxation issues in Cyberspace • Conclusion of Unit
4.	**Computer Forensics**
	• Introduction of Unit • Introduction, Subdivisions, Steps of Computer Forensics, Analyzing the Suspected Computer • Incidence Response, Digital Forensic Science, The need for Computer Forensics • Cyber Forensics and Digital Evidence • Digital Forensics Life Cycle, Chain of custody concept and Challenges in Computer Forensics, Forensic Imaging • Conclusion of Unit
5.	**Copyright and Cyber law**
	• Introduction of Unit • Concept of Copyright and Patent in Cyberspace, Copyright in the Digital Medium • Copyright in Computer Programmes, Copyright and WIPO Treaties • Concept of Patent Right, Relevant provisions of Patent Act 1970 • Data Storage on a Hard Drive, Data Storage on a Hard Drive, Hard Disk Drive addressing • Hard Disk Drive addressing, File corruption and Recovery, Fundamentals of drive imaging • Cloning and Issues in Imaging • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Cyber security - understanding cyber crimes,computer forensics and legal perspectives	Nina godbole and sunit belapure	1st	WILEY
2.	Computer Forensics: Principles And Practices	Linda Volonino, Reynaldo Anzaldua And Jana Godwin	1st	PEARSON
Reference Book				
3.	System Forensics Ankit Fadia,Boonlia, Prince Komal, 1st Vikas Publication			
3.	Cyber law in India, Farooq Ahmad 1st Pioneer Publishers, New Delhi			
4.	Information technology law and practice, Sharma Vakul, Universal Law Publishing Co Ltd			
Online Resources				
5.	http://www.vjolt.net/vol12/issue3/v12i3_a1-Azam.pdf			
6.	https://www.wipo.int/export/sites/www/amc/en/docs/wipointaudrp.pdf			
7.	http://www.iibf.org.in/documents/Cyber-Laws-chapter-in-Legal-Aspects-Book.pdf			

Code : BCEECE03125 **Installation and Configuration of Server** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Elaborating the basic concepts of selection, configuration and installation of Server.
- Articulate and planning of server, its configuration along with various types of data base and server.
- Explore knowledge about server role in the real environment.
- Discover and configure Print and Document Services and Servers for Remote Management using Server
- Articulate and planning of Local storage, its configuration along with various types of file systems and Formats.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction of Server**	**07**
2.	**Installing and Configuring Window's Servers 2022**	**08**
3.	**Installing and Configuring RHEL 9.1 Servers**	**08**
4.	**Installing and Configuring SQL Server 2022**	**07**
5.	**Installing and Configuring Oracle Database 21c server**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Server**
	• Introduction of Unit • Introduction-characteristics –types of servers-c/s • Building blocks-c/s OS: base services-extended services- GUI vs. • OOUI. Base Middleware: NOS-RPC-Peer-to-Peer • Communication-sockets-SQL database servers-SQL • Database server architecture-trigger, • Stored procedures-rules. • Conclusion of Unit
2.	**Installing and Configuring Window's Servers 2022**
	• Introduction of Unit • Introduction of window's server ,Edition, Supporting Server Role, • Installing Windows Server 2012: • System Requirement, Types of Window's server Core Capabilities, Upgrade paths • Installing Windows Server and Migration Tools • Configuring Servers: Post-Installation Tasks, Configuring NIC Teaming, Using Roles • Manager, • Configuring Servers: Active Directory ,Active Directory Federation, • Network Policy Access Services (NPAS),Dynamic Host Configuration Protocol • (DHCP) Server, • Domain Name System (DNS) Server, Web & Application Servers, Printer, File Services Server, FTP • Conclusion of Unit
3.	**Installing and Configuring RHEL 9.1 Servers**
	• Introduction of Unit • Introduction of RHEL Server, System Requirement, Type of Linux Server ,Capabilities of Linux Server • Installing RHEL Server, Repository installation. • Configuring Servers : FTP, Domain Name System (DNS) Server, Web & Application Servers. • Conclusion of Unit
4.	**Installing and Configuring SQL Server 2022**
	• Introduction of Unit • Introduction of SQL server, Hardware Requirements • SQL Server installation, Completing the SSMS Install • Connecting to your Database, Creating a Database for your Assignments • Dual Booting Versus Using a Virtual Machine • Conclusion of Unit
5.	**Installing and Configuring Oracle Database 21c server**
	• Introduction of Unit • Introduction of Oracle Database 21c server, Hardware Requirements • Oracle Database 21c server installation in Linux or Windows • Create User , Connect User, Create Data base, Data base Connect to User • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Fedora 9 and Red Hat Enterprise Linux Bible	Christopher Negus		
2.	Windows Server 2022 Beginners Guide	Howard J. Wall	2022	
Reference Book				
3.	Windows Server 2022 & Powershell, Sara Perrott, Dummies			
4.	Red Hat Enterprise Linux 8 Administration, Miguel Perez Colino, Pablo Iranzo, Packt Publishing			
5.	Oracle 19c Database Administration, Tanveer A			
Online Resources				
6.	https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/9			
7.	https://github.com/PacktPublishing/Red-Hat-Enterprise-Linux-RHEL-9-Administration			
8.	https://docs.oracle.com/en/cloud/saas/supply-chain-management/22b/index.html			

Code :BCEECE03126	Introduction to UI/UX	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Student will able to

- Gain knowledge about the critical importance of user interface design
- Use learned skills to solve problems of various layouts of User Experience Design
- Apply the functionality of different design in web designing
- Properly select and utilize design thinking processes and UX/UI tools
- Develop ideas and various app designs and website pages.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction To HCI	08
2.	UX Introduction	09
3.	Mobile UI Design	09
4.	Best Practices In UI Design	07
5.	Prototype & Test	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to HCI**
	• Introduction of Unit • Introduction to HCI • HCI and Software Engineering • Models of HCI — Cognitive, Interactive • Fitt's Law • Communication & Collaboration Models • Programming Interactive System • Task Analysis • Guidelines in HCI • Conclusion of unit
2.	**UX Introduction**
	• Introduction of Unit • User Interaction with the products, applications and services • Why User Experience Design • What is User Experience (UX) Design • Core elements of User Experience. • How these elements work together. • Defining the UX Design Process and Methodology • Visual Design Principles • Information Design and Data Visualization • Conclusion of Unit
3.	**Mobile UI Design**
	• Introduction of Unit • Mobile Interaction Styles: Keypads, Touchpads, Gestures • Disruption & Innovation • Screen Design and Layouts • UX Tools for Wire framing and Prototyping • UX Tools for User Research and User Testing • UX Tools for Organizing Information • Conclusion of Unit
4.	**Best Practices in UI Design**
	• Introduction of Unit • Introduction to Perl • Mobile UI Best practices HTML & CSS • HTML Tags and forms • CSS - Properties • Mobile UI Best practices JS • Conclusion of Unit
5.	**PROTOTYPE & TEST**
	• Introduction of Unit • What is Usability Testing? • Types of Usability Testing • Usability Testing Process • How to prepare and plan for the Usability Tests? • Prototype your Design to Test? • Quality assurance

	• Alpha testing • Launching you project • Support • Post launch activities • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Human Computer Interaction	Alan Dix, Janet Finlay	3rd edition 2004	Pearson Education
2.	The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques	Wilbert 0. Galitz	3rd edition 2007	Wiley
3.	Human Computer Interaction	Alan Dix, Janet Finlay	3rd edition 2004	Pearson Education
Reference Book				
1.	UX for Dummies, Donald Chesnut , Kevin P. Nichols , 2014,Wiley India Pvt. Ltd			
2.	UX for beginners, Mekkie Bansil,2016,O Really			
Online Resources				
1.	https://learnui.design/			
2.	https://www.skillshare.com/browse/ui-ux-design			
3.	https://www.youtube.com/watch?v=LupF26_Zs5Y			

Code : BUACHU3208	Communication Skills-I	1 Credits [LTP: 0-0-2]

COURSE OUTCOME
Students will be able to:

- Demonstrate depth of understanding, observing complexity, improve insight and develop independent thought and persuasiveness.
- Determine the main ideas of the text by using key details and compare & contrast the most important points with the help of their perspective.
- Practice the qualities of writing style by applying the concepts of sentence conciseness, accuracy, readability, coherence and by avoiding wordiness or ambiguity.
- Distinguish words and phrases as per their intonation patterns and interpret the audios based on different situations
- Demonstrate the understanding of impactful conversational skills, presentation skills & telephonic conversation by considering the need of the audience.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Intrapersonal/Interpersonal Skills**	**6**
2.	**Reading Skills**	**4**
3.	**Writing Skills**	**6**
4.	**Listening Skills**	**4**
5.	**Speaking Skills**	**5**

B. DETAILED SYLLABUS

	LIST OF ACTIVITIES
1.	Self – Awareness & Self-Introduction
2.	Goal Setting: Ambition induced, interest induced or environment conditioned
3.	Cultivating Conversational Skills
4.	Role Plays : Selection of varied plots, characters & settings
5.	Reading skills I: Newspaper Reading & General Article Reading
6.	Writing Skills I: Story Making by jumbled words
7.	Understanding and Applying Vocabulary
8.	Listening Skills I: Types and practice by analyzing situational listening
9.	Speaking Skills I: JAM
10.	PowerPoint Presentation Skills-I
11.	Telephonic Etiquettes and Communication
12.	Recognizing, understanding and applying communication style (Verbal/Non-Verbal)

Code :BULCSE3201 **Skill Enhancement Generic Course-III** **1 Credits [LTP: 0-0-2]**

COURSE OUTCOMES:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

	LIST OF LABS
1	Objective Building, Parts of speech, Nouns, Numbers & Genders, Importance of soft skills
2	Logarithms, Number Theory
3	Tenses
4	Number system- Fractions & Decimals
5	Stress Management Techniques, Critical Thinking
6	Modal Verbs & Conditional Tense, Working under pressure
7	Boosting brain power for fast learning & unlearning
8	Pronouns, Adverbs & Adjectives
9	Emotional Intelligence, 5 levels of listening
10	Remainder Theoram
11	Points, lines & angles
12	Article Writing

Code :BUVCCE3101	Digital Marketing	2 Credits [LTP: 2-0-0]

COURSE OUTCOME

Students will be able to:

- have an adequate analyzing of Digital Marketing, its scope, objectives, opportunities and it challenges
- help students develop create toward Digital Strategy building & its effectiveness.
- applying alternatives for Dynamic organization to ensure their success in highly competitive sale environment and to analyze the concept of Internet marketing and its applications
- analyze the digital tools effectively for Social Media Marketing.
- help students develop an understanding toward E-mail marketing and its various application

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**An overview of Digital Marketings**	**05**
2.	**Digital Marketing Planning and Structure**	**04**
3	**Internet Marketing**	**05**
4.	**Social Media Marketing**	**05**
5.	**E-mail marketing and Applications**	**05**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**An overview of Digital Marketing**
	• Introduction of Unit • Introduction to Digital Marketing • Different Ways to Market Your Business Online • Evolution of Digital Marketing • Status of Digital Marketing in India • How Digital Marketing Works • Traditional vs. Digital Marketing • New Trends for Online Marketers • Digital Marketing Strategies • 6 Cs of Digital Marketing • Impact of Digital Marketing on Business • Benefits of Digital Marketing • Drawbacks of Digital Marketing • Internet Marketing in India – Challenges • Conclusion of Unit
2.	**Digital Marketing Planning and Structure**
	• Introduction of Unit • Creating initial digital marketing plan • Target group analysis, In bound vs Outbound Marketing, • Content Marketing, Understanding Traffic, Understanding Leads Strategic Flow for Marketing Activities. • WWW, Domains, Buying a Domain, Website Language & Technology, Core • Objective of Website and Flow • One Page Website, Strategic Design of Home Page, Optimization of Web sites, • Application of Word Press in Digital Marketing, Application of CSS, HTML & Java Script for web page design • Conclusion of Unit
3.	**Internet Marketing**
	• Introduction of Unit • Marketing and Internet • Market place to Marketspace • Online buyer behavior, suppliers, Intermediaries Websites • Types of Websites, Web portals like: B2B, B2C,C2B,C2C, B2E(Business to Employee) • Social Networking • The promise and challenges of online marketing • The Indian Internet Marketing Mix. • Significance of Internet marketing. • Traditional vs. Online Marketing • Conclusion of Unit
4.	**Social media Marketing**
	• Introduction of Unit • Introduction of Social Media Marketing • How Social media marketing works • Different components or Tools for Social Media Marketing • Facebook Marketing, Google Ad Words • YouTube Marketing, Content Marketing

	• Meme marketing, Affiliate Marketing • LinkedIn, Twitter, Instagram • Keywords with SEO marketing- On page Search Engine Optimisation, Off page SEO, why search • Engine marketing. • SEM and its application, Benefits of SEM • Blogging as a marketing strategy, Types of Blogs, What is Blogging? Benefits of Blogging. Pitfalls of Blogging. • Conclusion of Unit
5.	**E-mail Marketing and Applications**
	• Introduction of Unit • Introduction of E-mail marketing • E-mail Marketing - What is it? Why do it and How? • Types of E-mail Marketing • Comparison to Traditional Mail • Opt-in E-mail Advertising • How to deal with Spam Filter • Choosing your metrics • Tracking Landing Pages • Topl0 Benefits of E-mail Marketing • E-mail-Marketing Strategy Checklist • Effective E-mail Marketing Techniques • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Digital Marketing	Dave Chaffey	7 th	Pearson
2.	Marketing 4.0: Moving from Traditional to Digital Hardcover	Philip Kotler	Latest	Pearson
	Reference Book			
1.	Digital Marketing, Dave Chaffey/Fiona Ellis, Pearson			
2.	Social Media Marketing All-In-One For Dummies, JanZimmerman and Deborah			
3.	Digital Marketing Strategy, Simon Kingsnorth, KoganPage			
	Online Resources			
1.	https://ejournal.lucp.net/index.php/ijrtbt/article/view/191			
2.	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3638929			
3.	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3308684			

IV SEMESTER

Major Core Courses

Code: BCECCE4101 **Computer Networks** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Gain the knowledge of the basic computer network technology and become familiar with layered communication architectures (OSI and TCP/IP).
- Analyze the basics of Framing and Error detection including parity, checksums, and CRC.
- Gain the knowledge of the basic IP configuration used for Networking. Also clear the concept of Logical and Physical Addressing
- Analyze the concepts of reliable data transfer and how TCP implements these concepts.
- Learn the principles of WAN routing and the semantics.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Networking Fundamentals & Internet**	09
2.	**Basics Presentation & Application Layer**	07
3.	**Basics of Transport layer & Network, Layer**	08
4.	**Basics of Data Link Layer**	07
5.	**Basics of WAN Technology**	07

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Networking Fundamentals & Internet**
	• Basics of Network & Networking, Types of Networks: LAN, MAN, WAN, Peer-to-Peer & Client/Server, Workgroup Vs. Domain, Network Topologies. The Internet, Network Devices- NIC, Hub, Switch, Bridge, Router, Gateways, Firewall, Repeater, CSU/DSU, and modem, Introduction of OSI model, and TCP/IP Model, Comparison between OSI model & TCP/IP model. Physical Layer: Types of Transmission Media, Communication Modes, Wiring Standards and Cabling- straight through cable, crossover cable, rollover cable, Media connectors (Fibre optic, Coaxial, and TP etc.) Switching Methods (Circuit/Packet Switching) Uni-cast, Multicast, Broadcast • Conclusion & Real Life Application
2.	**Basics Presentation & Application Layer**
	• Presentation Layer protocols:-TLS, SSL, MIME • Application Layer: Functions and support, Application Layer Protocols: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP, NTP. • Conclusion & Real Life Application
3.	**Basics of Transport layer & Network, Layer**
	• Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets • Network Layer: Internet Protocol (IP), IP standards, versions, functions, The IPv4 Datagram Format, IPv4 addressing, IPv4 address Classes, IPv4 address types, Default Gateway, Public & Private IP Address, methods of assigning IP address, Subnet Mask and subneting, IPv6 address, types, assignment, Data encapsulation, Introduction to Routing and Switching concepts. • Conclusion &Real Life Application
4.	**Basics of Data Link Layer**
	• Application of Data Link Layer: Framing and Error detection and correction. Stop and Wait protocol, Sliding Window protocols Go-Back-N Protocol, Channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols. Wireless Networking, Types of Wireless Networks: Ad-hoc mode, Infrastructure mode, wireless LAN standards: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, wireless security Protocols: WEP,WPA, 802.1X. • Conclusion & Real Life Application
5.	**Basics of WAN Technology**

	• What Is a WAN?, WAN Switching, WAN Switching techniques Circuit Switching, Packet Switching etc., Connecting to the Internet : PSTN, ISDN, DSL, CATV, Satellite-Based Services, Last Mile Fibre, Cellular Technologies • Connecting LANs: Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual LAN, Virtual Private Networking • Conclusion &Real Life Application

E. **RECOMMENDED STUDY MATERIAL**

S. No	Text Books:	Author	Edition	Publication
1.	Computer Network	AndrewS. Tanenbaum	2013	Pearson
2.	Computer Networking: Top Down Approach	Kurose. Ross	2017	Pearson
Reference Book				
3.	Networking All in One – Doug Lowe 7th edition Publisher- Wiley			
Online Resources				
4.	https://www.edx.org/learn/computer-networking			
5.	https://www.youtube.com/watch?v=VwN91x5i25g			

Code: BCECCE4102	OOPS With Java	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Acquire the concepts and features of object oriented programming
- Learn java's exception handling mechanism, multithreading, packages and interfaces.
- Implement object oriented programming concepts using java
- Apply object oriented programming features and concepts for solving given problem
- Implement the concept of class and objects with access control to represent real world entities.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Java**	08
2.	**Working with classes ,objects and Inheritance**	09
3.	**Packages, Interfaces & Exception Handling**	09
4.	**Multithreaded Programming & Applet**	07
5.	**JAVA Database Connectivity (JDBC) and Java 8 Features**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Java**
	• Introduction to Unit • History and Overview of Java • Object Oriented Programming features. • Class Fundamentals • Declaring objects, Assigning object reference variables. • Literals, variables comments, separators, • Scope and Life Time of Variables • Data types - Integers, Floating point, characters, Boolean, • Type conversion and casting • Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence. • Conclusion of unit
2.	**Working with classes, objects and Inheritance**
	• Introduction to Unit • Control Statements – Selection Statements - if, Switch, Iteration Statements - While, Do-while, for Nested loops, Jump statements. • Methods - constructors, “this” keyword, finalize ( ) method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects. • Recursion, Access control, introducing final, understanding static. • Introducing Nested and Inner classes. • Command line arguments. • Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance.

	• Conclusion of Unit
3.	**Packages, Interfaces & Exception Handling**
	• Introduction to Unit • Definition and Implementation, Access protection importing packages. • Interfaces: Definition and implementation. • Exception Handling – Fundamentals, types, Using try and catch • Multiple catch clauses • Nested try Statements, Throw, finally. • User Defined Exception • Conclusion of Unit
4.	**Multithreaded Programming & Applet**
	• Introduction of Unit • Java thread model – main thread, creating single Multithreading • Is alive ( ) and join ( ) Methods • Thread – Priorities, Synchronization • Inter thread communication, suspending, resuming and stopping threads • Reading control input, writing control output, Reading and Writing files. • Applet Fundamentals – AWT package • AWT Event handling concepts. • Conclusion of Unit
5.	**JAVA Database Connectivity (JDBC) and Java 8 Features**
	• Introduction to Unit • Database connectivity – JDBC architecture and Drivers. • JDBC API - loading a driver, connecting to a database, creating and executing JDBC statements • Handling SQL exceptions. • Accessing result sets: types and methods. • JDBC application to query a database. • Introduction to java 8 features :-Functional Interfaces And Lambda Expressions • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	The complete reference Java –2	Herbert Schildt	V Edition,	TMH.
2.	SAMS teach yourself Java – 2	Rogers Cedenhead and Leura Lemay	3rd Edition,	Pearson Education
Reference Book				
1.	Object Oriented Programming with Java PUBLISHER PHI by M.T. Somashekara (Author), D.S. Guru (Author), K.S. Manjunatha (Author)			
2.	**“**Head First Java” by Kathy Sierra			
Online Resources				
1.	https://www.programiz.com/java-programming/online-compiler/			
2.	https://www.tutorialspoint.com/compile_java_online.php			
3.	https://onecompiler.com/java			

Code: BCECCE4103 Relational Database Management System 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Describe DBMS architecture, physical and logical database designs, database modeling, relational, hierarchical and network models.
- Identify basic database storage structures and access techniques such as file organizations, indexing methods including B-tree, and hashing.
- Learn and apply structured query language (SQL) for database definition and database manipulation.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Analyze various transaction processing, concurrency control mechanisms and database protection.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Database Management System**	**7**
2.	**RDBMS**	**7**
3.	**SQL**	**7**
4.	**PL/SQL**	**8**
5.	**Oracle, Trigger and wrapping**	**7**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Database Management System**
	• Introduction to Database Management System • Characteristics of database approach • Advantages of DBMS • Schemas: Three schema architecture - The external level, the conceptual level and the internal level. • Data Independence • Database languages and Interfaces • Roles of Database Administrator • Introduction to Data Models (Hierarchical, Network and Relation) • Entity type, Entity sets, Attributes and keys. • The ER Model: ER Diagram & Database design with the ER Model • Conclusion of the Unit
2.	**RDBMS**
	• Introduction to Distributed Database • Classification of DBMS • Introduction to RDBMS • Relational Model –Concepts • Relational operations (Insert, delete, update, select, project, rename, union, intersection, minus, Join, division) • Transactions and ER mapping Examples • Normalization of RDBMS (1NF, 2NF, 3NF and 4NF) and inference rules. • Conclusion of the Unit
3.	**SQL**
	• Introduction to Unit • DBMS v/s RDBMS • Introduction to SQL: Data types, Constraints • Commands in SQL: Create table, Drop command, Alter Queries in SQL • Statements in SQL (Insert, delete and update) • Features of SQL • Manipulation of data • Tables in SQL • Conclusion of the Unit
4.	**PL/SQL**
	• Introduction to PL/SQL • Approaches to database programming: with function calls, Embedded SQL using CURSORs, Dynamic SQL, SQL commands in Java, Retrieving multiple triples using Iterators • Advantages of PL/SQL • Features of PL/SQL :Blocks structure, Error handling, Input and output designing, variables and constant, data abstraction, control structures and subprogram • Fundamentals of PL/SQL : character sets, lexical, delimeters, identifiers, declarations, scope and visibility, Static and dynamic and static SQL, Implicit and explicit locking • Conclusion of the Unit
5.	**Oracle, Trigger and wrapping**
	• Introduction to Oracle, Trigger and wrapping • Functions/responsibilities of DBA • Oracle product details • Oracle files, System and User process • Oracle Memory • Protecting data: Oracle backup & recovery

	• Triggers - types, uses, data access for triggers • PL/SQL Packages and Wrapping • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Database System Concepts	S. Sudarshan, Henry F. Korth, Avi Silberschatz	6th Edition	McGraw Hill
2.	SQL, PL/SQL	Ivan Bayross		Bpb
3.	Oracle Complete Reference	Kevin Loney		Bpb
Reference Book				
4.	PL/SQL, best practices, Bpb Publications, Steven Feuerstein			
5.	The Oracle Cook Book, Bpb Publications, Liebschuty			
6.	Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey			
Online Resources				
7.	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm			
8.	https://nptel.ac.in/courses/106106093			
9.	https://www.coursera.org/learn/introduction-to-relational-databases			

Code:BCECCE4104	Advance Data Structure	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Explain the basic principles and operations of data structures.
- Analyze algorithms and to determine algorithm correctness and time efficiency class.
- Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.
- Apply the concepts of advanced Trees and Graphs for solving problems effectively.
- Analyze the given scenario and choose appropriate Data Structure for solving problems.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Hashing**	**07**
2.	**Priority Queues (Heaps)**	**08**
3.	**Trees**	**07**
4.	**Graphs Algorithms**	**07**
5.	**Disjoint Sets and String Matching**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Hashing**
	• Introduction to Hashing • Hash Function • Separate Chaining • Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library • Universal Hashing • Extendible Hashing. • Conclusion of Unit
2.	**Priority Queues (Heaps)**
	• Introduction to Priority Queues (Heaps) • Model • Simple implementations • Binary Heap: Structure Property, Heap Order Property, • Basic Heap Operations: insert, delete, Percolate down • Other Heap Operations • Introduction toBinomial Queues • Binomial Queue Structure • Binomial Queue Operations • Implementation of Binomial Queue • Priority Queues in the Standard Library. • Conclusion of Unit
3.	**Trees**
	• Introduction to Trees • AVL: Single Rotation, Double Rotation • B-Trees • Multi-way Search Trees – 2-3 Trees • Searching for an Element in a 2-3 Tree • Inserting a New Element in a 2-3 Tree • Deleting an Element from a 2-3 Tree • Red-Black Trees • Properties of red-black trees: Rotations, Insertion, Deletion. • Conclusion of Unit
4.	**Graphs Algorithms**
	• Introduction to Graphs Algorithms • Elementary Graph Algorithms: Topological sort • Single Source Shortest Path Algorithms: Dijkstra‘s, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall‘s Algorithm • Conclusion of Unit
5.	**Disjoint Sets and String Matching**
	• Introduction to Disjoint Sets • Equivalence relation • Basic Data Structure • Simple Union and Find algorithms • Smart Union and Path compression algorithm. • Introduction to String Matching

	• The naive string-matching algorithm • The Rabin-Karp algorithm • The Knuth-Morris-Pratt algorithm. • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Structures and Algorithm Analysis in C++	Mark Allen Weiss	4 th Edition	Pearson
2.	Introduction to Algorithms	Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	3 rd Edition	The MIT Press.
Reference Book				
1.	Fundamentals of Computer Algorithms, 2nd Edition, 2009, University Press Pvt. Ltd, Ellis Horowitz, Satraj Sahani and Raja sekharam.			
2.	Advanced Data Structures, Oxford University Press, 2018, ReemaThareja, S. Rama Sree.			
Online Resources				
1.	https://www.coursera.org/learn/advanced-data-structures			
2.	https://ocw.mit.edu/courses/6-851-advanced-data-structures-spring-2012/			
3.	https://nptel.ac.in/courses/106106133			
4.	https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures			
5.	https://freevideolectures.com/course/2279/data-structures-and-algorithms			

PRACTICAL

Code:BCECCE4201	Computer Networks Lab	1 Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Use the clamping tool for making Cross and Straight cable and identify network IP
- Create local area network and do file sharing activity
- Configure switch and routers
- Configure WEP and Ethernet.
- Recognize static and dynamic routing.

A. LIST OF EXPERIMENTS:

1	Implementation of TCP/IP protocol – I
2	Implementation of TCP/IP protocol – II
3	Troubleshooting Scenarios Network – I
4	Troubleshooting Scenarios Network – II
5	Router – Configuration – I
6	Router – Configuration – II
7	Router – Configuration – III
8	Configuration of IP Address for a Router – I
9	Configuration of IP Address for a Router – II
10	Setting up of Passwords – I
11	Setting up of Passwords – II
12	Setting up of Passwords – III

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Communications and Networking,	Behrouza A. Forouzan	Fourth Edition	TMH.
2.	Computer Networks	A.S.Tanenbaum	Fourth Edition	Pearson
Reference Book				
3.	Data Communications and Networking, TATA McGraw Hill, Ferouzan, Behrouz A.			
4.	Data and Computer Communication, Pearson Education , Stallings William			
5.	Computer Networks, PHI, Tanenbaum, Andrew S,			
Online Resources				
6.	https://www.edx.org/learn/computer-networking			
7.	https://www.udemy.com/topic/computer-network/			
8.	https://www.coursera.org/computer_network			

CCode: BCECCE4202	OOPs with Java Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- To Implement object oriented programming concepts to solve real world problems
- To implement the concept of class and objects with access control to represent real world entities.
- Illustrate different techniques on creating and accessing packages (fully qualified name and import statements).
- Create concepts on file streams and operations in java programming for a given application programs
- Create the backend connectivity process in java program by using JDBC drivers

A. LIST OF EXPERIMENTS:

1	A. Write a program to print "Hello World" in Java. B. Write a program to add two numbers C. Write a program to demonstrate the different access specifiers D. Write a program which uses different packages
2	A. Write a program to demonstrate inheritance, abstraction, encapsulation and Polymorphism. B. Write a program to find the factorial of n numbers C. Write a program to calculate Fibonacci series D. Write a program to add n numbers and series
3	A. Write a program to create an array and store elements into the array. B. Write a program to find the sum of elements in an array C. Write a program to demonstrate switch case, if, if-else and for loop
4	A. Write a program to demonstrate the working of methods. B. Write a program which has four methods – add(), subtract(), multiply() and divide() and demonstrate a simple console calculator. C. Write a program to accept command line arguments and display them to the user
5	A. Write a program to create a package. B. Write a program to handle different exceptions
6	A.Write a program to demonstrate try-catch, throw and throws. B. Write a program for user defined exception
7	A. Write a program to read a file Write a program to write into a file
8	Write a program to demonstrate client server communication (socket programming)
9	Write a program to create threads and manipulate them
10	Write a program to create a user interface to check user authentication.
11	Write a program to create a registration form and save the details into a file
12	Write a program to save and fetch the details from database

A. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	The complete reference Java –2	Herbert Schildt	5th Edition,	TMH.
2	SAMS teach yourself Java – 2	Rogers Cedenhead and Leura Lemay	3rd Edition,	Pearson Education
Reference Book				
1	The complete reference Java –2			
2	SAMS teach yourself Java – 2			
Online Resources				

1	https://www.programiz.com/java-programming/online-compiler/
2	https://www.tutorialspoint.com/compile_java_online.php

Code: BCECCE4203 Relational Database Management System Lab 1 Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Analyze, appreciate and effectively explain the underlying concepts of database technologies.
- Design and implement a database schema for a given problem-domain.
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.

A. LIST OF EXPERIMENTS:

1.	To setup and removal phases of a Student database using the basic Data Definition Language (DDL) commands: 1. CREATE 2. ALTER 3. DROP 4. RENAME 5. TRUNCATE
2.	The routine operation of the Employee database like retrieve, insert and modify by basic Data Manipulation Language (DML) commands: 1. INSERT 2. UPDATE 3. DELETE
3.	To Retrieve data from one or more tables using DATA RETRIEVAL LANGUAGE (DRL) commands SELECT FROM SELECT - FROM –WHERE SELECT - FROM -GROUP BY SELECT - FROM -ORDER BY JOIN using SELECT - FROM - ORDER BY JOIN using SELECT - FROM - GROUP BY UNION INTERSET MINUS
4.	DATA CONTROL LANGUAGE (DCL) and TRANSATIONAL CONTROL LANGUAGE (TCL) commands. Creating objects: tables, views, users, sequences, Collections etc. Privilege management through the Grant and Revoke commands Transaction processing using Commit and Rollback Save points.
5.	Queries for following functions Conversion functions (to_char, to_number and to_date) string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
6.	Simple queries: selection, projection, sorting on a simple table for employee database Small-large number of attributes Distinct output values Renaming attributes Computed attributes

	Simple-complex conditions (AND, OR, NOT) Partial Matching operators (LIKE, %, _, *, ?) ASC-DESC ordering combinations Checking for Nulls
7.	To manipulate data items and returning the results using Group functions or Aggregate functions and Single Row or scalar functions: Group functions or Aggregate functions: Sum(), Avg(), Min(), Max() and Count() Single Row or scalar function: Abs(), Power(), Sqrt(), Round(), Exp(), Greastest(), Least(), Mod(), Floor(), Sign() and Log().
8.	Multi-table queries (JOIN OPERATIONS) Simple joins (no INNER JOIN) Aliasing tables – Full/Partial name qualification Inner-joins (two and more (different) tables) Inner-recursive-joins (joining to itself) Outer-joins (restrictions as part of the WHERE and ON clauses) Using where & having clauses
9.	Write Nested queries to retrieve the name of each employee who has a dependent with the same first name and same sex as the employee using following Nested queries. In, Not In Exists, Not Exists Dynamic relations (as part of SELECT, FROM, and WHERE clauses)
10.	Write a query to make a list of all project numbers for projects that involve an employee whose last name is ‘Smith’, either as a worker or as a manager of the department that controls the project using the following Set Oriented Operations Union Difference Intersection Division
11.	PL/SQL Programming using the following Programs using named and unnamed blocks Programs using Cursors, Cursor loops and records
12.	PL/SQL Programming using Creating stored procedures, functions and packages Error handling and Exception Triggers and auditing triggers

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Database System Concepts	S. Sudarshan, Henry F. Korth, Avi Silberschatz	6th Edition	McGraw Hill
2.	SQL, PL/SQL	Ivan Bayross		Bpb
3.	Oracle Complete Reference	Kevin Loney		Bpb
Reference Book				
4.	PL/SQL, best practices, Bpb Publications, Steven Feuerstein			
5.	The Oracle Cook Book, Bpb Publications, Liebschuty			
6.	Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey			
Online Resources				
7.	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm			
8.	https://nptel.ac.in/courses/106106093			
9.	https://www.coursera.org/learn/introduction-to-relational-databases			

Minor Stream Courses

Code:BADCCE4101 **Fundamental of Machine Learning** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Demonstrate and distinguish between types of machine learning techniques
- Examine the correlation coefficient for a given data set
- Implement applications with classification and clustering techniques
- Examine the uses of appropriate performance metrics of machine learning
- Modify existing machine learning algorithms to improve classification efficiency

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A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Machine Learning**	**7**
2.	**Regression**	**7**
3.	**Classification**	**9**
4.	**Clustering**	**8**
5.	**Performance Metrics**	**8**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Machine Learning**
	• Introduction to Machine Learning • Definition of Machine Learning • Working principles of Machine Learning • Classification of Machine Learning : Supervised Learning, Unsupervised Learning, Reinforcement Learning • Supervised Learning: Classification and Regression • Unsupervised Learning: Clustering and Association • Reinforcement Learning • Types of Reinforcement learning : Positive Reinforcement and Negative Reinforcement • Working of Reinforcement learning • Markov Decision Process • Reinforcement Learning Algorithms: Q-Learning and State Action Reward State action (SARSA) • Application of Reinforcement Learning • Conclusion of Unit
2.	**Regression**
	• Introduction to Regression • Types of Regression: Linear regression, Logistics regression, Ridge Regression, Lasso Regression, Bayesian Linear Regression and Polynomial Regression • Regression and Correlation • Crosstabs and Scatterplots • Pearson's r • Regression – Finding The line • Regression – Describing the line • Contingency Tables • Conclusion of Unit
3.	**Classification**
	• Introduction of Unit • Classification model building • Types of Classification Algorithm: Binary Classification and Multi Class Classification • Logistic Regression • k-Nearest Neighbors • Decision Trees • Random Forest • Support Vector Machine • Naïve bayes • Conclusion of Unit
4.	**Clustering**
	• Introduction to unit • K-Means Clustering: • Hierarchical Clustering: • Density-Based Clustering (DBSCAN) • Gaussian Mixture Models (GMM) • Spectral Clustering: • Conclusion of Unit
5.	**Performance Metrics**

	• Introduction of Performance metrics • Performance metrics for Regression : Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), R-Squared, Adjusted R-squared • Performance metrics for classification: Accuracy, Confusion Matrix, Precision, Recall, F1 score, ROC AUC, Kappa, MCC (Matthews Correlation Coefficient) and Log-loss. • Performance metrics for clustering : Silhouette Score, Rand Index, Adjusted Rand Index, Mutual Information, Calinski-Harabasz Index and Davies-Bouldin Index • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	MachineLearning–AnAlgorithmic Perspective,ChapmanandHall	Stephen Marsland	Second Edition	CRCPress
2.	MachineLearning–AnAlgorithmic Perspective,ChapmanandHall	Stephen Marsland	Second Edition	CRCPress
Reference Book				
1.	IntroductiontoMachineLearning3e(AdaptiveComputationandMachineLearningSeries),ThirdEdition, MIT Press,Ethem Alpaydin.			
2.	MachineLearning:TheArtandScienceofAlgorithmsthatMakeSenseofData,1stEdition,Cambridge UniversityPress,PeterFlach.			
3.	LearningfromData",AMLBookPublishers,Y.S.Abu-Mostafa,M.Magdon-Ismail,andH.-T.Lin			
Online Resources				
1.	https://github.com/adeshpande3/Machine-Learning-Links-And-Lessons-Learned			

Code:BADCCE4201	Fundamental of Machine Learning Lab	1 Credits [LTP: 0-0-2]

A. List of programs

1	Toreaddatasettopandasdataframeanddisplaythefirstfewrowsusingthe"head"function inPython.
2	ToworkwithPandasandXlsxWriter
3	ToworkwithcsvfilesinPythonandapplypreprocessingtechniquessuchasScaling,Normalization, Binarization,StandardizationandDataLabelingaswellasdividethedataintotrainandtestsplit.
4	ToimplementSimpleLinearRegressiontopredicttheHousepriceusingdatasetsfromanyDatasource
5	ToimplementLogisticRegressiontopredictthecarpricesinPython.
6	Usinglogisticregressiontorecognizehand-writtendigits(0to9)byloadingthedatasetfromanyData SourceinPython.
7	Onasetofemaildataandbuildaclassifierontheprocessedemailsusing aSVMtodetermineifthey arespamornot. inPython
8	ToimplementDecisionTreeclassifieronPimaIndianDiabetesinPython.
9	ToimplementRandomforestclassificationinPythononirisdatasetfromits weblink.
10	UsingNaïveBayeswithtrainingexamplesofindividualsontohigh,mediumandlowcredit-worthiness inPython.
11	Toimplementk-meanclusteringonsimpledigitsdataset.K-meanswilltrytoidentifysimilardigits without using the original label information in Python
12	ToimplementMean-Shiftalgorithmon2Ddatasetcontaining4differentblob inPython.

B. RECOMMENDEDSTUDYMATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	MachineLearning-AnAlgorithmic Perspective	StephenMarsland	"I",2nd Edition	
2.	DataMiningConceptsandTechniques	JiaweiHan and MichelineKamber	2nd Edition	Elsevier
3.	IntroductiontoMachinelearning	NilsJ.Nilsson		
ReferenceBook				
1.	IntroductiontoMachineLearning3e(AdaptiveComputationandMachineLearningSeries),ThirdEdition, MIT Press, Ethem Alpaydin.			
2.	MachineLearning:TheArtandScienceofAlgorithmsthatMakeSenseofData,1stEdition,Cambridge UniversityPress,PeterFlach.			
OnlineResources				
1.	https://nptel.ac.in/courses/106106182			

Code:BUACHU4212	Communication Skills-II	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Develop the ability to identify difficult sounds, words and phrases to strengthen listening and applying these improved skills in spoken communication.
- Cultivating knack for reading and writing by understanding the nuances of sentence structure and presentation style.
- Applying negotiation and Identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargaining to closing.
- Develop a heightened awareness of the potential of digital communication and apply their knowledge in creating documents considering the needs of the netizens.
- Propose their outlook through exposure to new and different experiences and ideas and enrich their understanding of the issues under discussion.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Advanced Listening & Speaking Skills**	**6**
2.	**Advanced Reading & Writing Skills**	**6**
3.	**Art of Negotiation Skills**	**4**
4.	**Email Etiquettes**	**4**
5.	**Group Discussion**	**5**

B. LIST OF LABS

1.	Listening Skills II: Analysis of videos/audios by famous personalities
2.	Speaking Skills II: Extempore, Debate etc.
3.	Public Speaking: Key Concepts, Overcoming Stage Fear
4.	Story-Telling Skills: Techniques of Story Telling, Prompts for story creation
5.	Situational Conversational Skills
6.	PowerPoint Presentation Skills-II
7.	Reading Skills II: Technical Writings, Research Papers& Articles
8.	Writing Skills II: Blog Writing &Review Writing
9.	Picture Perception & Discussion
10.	Art of Negotiation: Identify the qualities of successful and unsuccessful negotiators. Identify different negotiation situations to practice during class.
11.	Email Etiquettes
12.	Group Discussion: Dos &Don'ts, Informal GD

Code:BULCSE4201 **Skill Enhancement Generic Course-IV** **1 Credits [LTP: 0-0-2]**

COURSE OUTCOMES:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

LIST OF LABS	
1	Averages, Mean, Median and Mode
2	Cognitive learning theory, Body Language basics
3	Heights & Distances
4	Sitting Arrangements
5	Fill Ups(Grammar based)
6	Error Detection, Confusing words
7	Alphanumeric Series
8	Verbal Analogy, One word substitution
9	Dices
10	Sentence Correction, Subject-Verb agreement
11	Statement & Assumptions, Setting SMART goals,
12	Persuasion Skills, Interview Preparation

Code:BUVCCE4102	Business Intelligence	2 Credits [LTP: 2-0-0]

COURSEOUTCOMES:

Studentswouldbeableto:

CO1: Gain knowledge of Business Intelligence
CO2: Elements of Business Intelligence Solutions
CO3:Build business projects
CO4: Generate and manage BI reports
CO5: BI Deployment, Administration & Security.

A. OUTLINEOFTHECOURSE

UnitNo.	Title oftheUnit	TimerequiredfortheUnit(Hours)
1.	**Introduction to Business Intelligence**	4
2.	**Elements of Business Intelligence Solutions**	5
3.	**Building the BI Project**	5
4.	**Reporting Authoring**	5
5.	**BI Deployment, Administration & Security**	5

B. DETAILEDSYLLABUS

Unit	UnitDetails
1.	**Introduction to Business Intelligence**
	• Introduction of the Unit • Understanding the scope of today's BI solutions and how they fit into existing infrastructure. Describe BI, its components & architecture. • The future of BI, better experience for all business users. • The Functional Area of BI Tools, Query Tools and Reporting. • OLAP and Advanced Analytic • Conclusionof the Unit
2.	**Elements of Business Intelligence Solutions**
	• Introduction of the Unit • Reports & ad hoc queries. • Dashboards & Scorecards development. • Metadata, Real time monitoring capabilities. • BI portals, web applications, Desktop applications. • Conclusion&Reallifeapplications • Conclusionof the Unit
3.	**Building the BI Project**
	• IntroductionoftheUnit • Planning the BI project, Project Resources, • Collecting User Requirements, • Validating BI Requirements • BI Design and Development • Conclusionof the Unit
4.	**Reporting Authoring**

	• IntroductionoftheUnit • Building reports with relational vs Multidimensional data models. • Types of Reports – List, crosstabs, Statistics, Chart, map, financial etc. • Data Grouping & Sorting, Filtering Reports. • Conditional formatting, Adding Summary Lines to Report • Conclusionof the Unit
5.	**BI Deployment, Administration & Security**
	• IntroductionoftheUnit • BI Architecture • Expanding BI Authentication Authorization, Access Permissions, Groups and Roles. • Manage Status & Monitoring. • Back Up and Restore • Conclusionof the Unit

C. RECOMMENDEDSTUDYMATERIAL:

Sr. No	ReferenceBook	Author	Edition	Publication
1	Business Intelligence	Mark Whitehorn , Mary Whitehorn	Ist	(IBM ICE Publication).
2	Data Strategy: How To Profit From A World Of Big Data, Analytics And The Internet Of Things	Bernard Marr	2nd	Kogan Page
3	The Data Detective: Ten Easy Rules to Make Sense of Statistics	Tim Harford	Latest	Riverhead Books
4	From Big Data to Big Profits: Success with Data and Analytics	Russell Walker	Latest	Oxford University Press

V SEMESTER

Major Core Courses

Code:BCECCE5101 **Design & Analysis of Algorithms** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Apply Divide and conquer. Greedy algorithm design techniques.
- To handle the dynamic programming concept with solving real word problem
- To manage of different Pattern matching algorithms.
- Apply randomize algorithms

A. To analyze the different class of algorithms and difference between them**CO-PO Mapping**

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction**	06
2.	**DynamicProgramming, Branchand Bound**	06
3.	**PatternMatchingandAssignmentProblem**	08
4.	**RandomizedAlgorithm**	08
5.	**NP-Hard and NP-CompleteProblem**	08

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction**
	• Introduction to Unit • Algorithm Specification , Algorithm Complexity and Order Notations. • Divide and Conquer Method :General Method, Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithm. • Greedy Method: General method, Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Tree: Prim's, Kruskal's Algorithm • Conclusion of Unit
2.	**Dynamic Programming, Branch and Bound**
	• Introduction to Unit • Dynamic Programming: Matrix Chain Multiplication, Longest Common • Subseuence and 0/1Knapsack Problem, All pairs shortest path, Flow shop scheduling • Branch And Bound: Traveling Salesman Problem, Bounding, FIFO Branch and Boun d, • Backtracking:The8-queensproblem,Hamiltoniancycles Comparison between Dynamic, Backtracking and Branch Bound • Conclusion of Unit
3.	**Pattern Matching and Assignment Problem**
	• Introduction to Unit • Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms. • Assignment Problems: Formulation of Assignment and Quadratic assignment Problem. • Conclusion of Unit.
4.	**Randomized Algorithm**
	• Introduction of Unit. • Probabilistic Analysis & Randomized Algorithms: Las Vegas algorithm, Monte Carlo algorithms for Min-Cut, randomized algorithm for 2- SAT. • Problem definition of Multi commodity flow, Flow shop scheduling and Network capacity • assignment problems. • Conclusion of Unit
5.	**NP-Hard and NP-Complete Problem**

	• Introduction of Unit. • Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP- Complete Problems - Satisfiability problem and Vertex Cover Problem. • Approximation Algorithms for Vertex Cover and Set Cover Problem • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	FundamentalsofComputerAlgorithms	E.Horowitz &S.Sahani	Latest	GalgotiaPublications
2.	Introduction to Algorithms	Corman,Leiserson&Rivest	Latest	MITPress
Reference Book				
3.	Algorithm Analysis & Design, Goodrich, Tamassia, Wiley			
4.	Computer Algorithms, Introduction to Design and Analysis, SaraBasse, A. V. Geider			
Online Resources				
5.	https://www.javatpoint.com/daa-tutorial			
6.	https://www.guru99.com/design-analysis-algorithms-tutorial.html			
7.	https://www.geeksforgeeks.org/system-design-tutorial/			

Code:BCECCE5102	Advance Java	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Design and build web applications using servlets and JSP Mange sessions in servlets and JSP
- Identify where and when to use MVC design pattern Create custom tag in JSP
- Develop web application using struts
- Develop database application using hibernate Develop IOC and DI using springs
- Develop web application using springs.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Java Servlets**	**08**
2.	**Java Server Pages(JSP)**	**07**
3.	**Java Server Faces**	**08**
4.	**Hibernate**	**08**
5.	**Springs**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Java Servlets**
	• Introduction of Unit • Servlets and HTTP Servlets, Filters, Security, Servlet Life Cycle, Servlets for the World Wide Web, Requests, Responses, and Headers, GET and POST, HTTP, Deploying a Servlet , Web Application Deployment Descriptor Structure, Servlet Configuration, Http Servlet Request/Response, Servlet Context, Session Management, • Case Study • Conclusion of Unit
2.	**Java Server Pages(JSP)**
	• Introduction of Unit: JavaBeans, Custom Tags and JSP Fragments, JSP Life Cycle, The Difference Between Servlets and JSP, JSP Syntax and Semantics, Elements and Template Data, JSP Configuration, Standard JSP Actions, Attributes, Comments, Quoting and Escape Characters, Exception Handling, JavaBeans and the JSP Expression Language, JSP Standard Tag Library, Custom Tag Libraries, Database Connectivity, • Building a Complete Web Application. • Case Study • Conclusion of Unit
3.	**Java Server Faces**
	• Introduction of Unit: features, life cycle, manage Beans, UI Components- input Text, output Text, form, command Button, input Text Area, input Hidden, input File, Bean, Validation, facelets, JSF JDBC, JSF with controllers, architectural overview of application developed with JSF and JSP, validator tag, data tables. • Conclusion of Unit
4.	**Hibernate**
	• Introduction of Unit: advantages, features, Architecture, Environment, Life Cycle, ORM Tool, First program, Sessions, Session factory, Persistent Class, Using the Session, MVC, Hibernate Query language, Criteria Query, Mapping Types, Annotations, Query Language, Native SQL. • Case Study • Conclusion of Unit
5.	**Springs**
	• Introduction of Unit: Architecture, Environment Setup, Create Sample Program, IOC Containers, Bean Definition, Bean Scopes, Bean Lifecycle, Dependency Injection, IOC Injection, Setter Injection, Injecting Inner Beans, Injecting Collection, Event Handling, MVC Framework. • Case Study • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Servlets and Java Server Pages	Jayson Falkner		Kevin Jones-2003
2.	Beginning Hibernate	Joseph B. Ottinger, Jeff Linwood, Dave Minter		Apress-2014
Reference Book				

3.	Professional Java Development with the Spring Framework, Rod Johnson, 8th edition –Wiley
4.	Core Java Server Faces, David M. Geary, 2004 – 3rd Edition-Prentice Hall
Online Resources	
5.	https://www.simplilearn.com/resources-to-learn-java-programming-article
6.	https://www.docdroid.net/mY1yTPu/advancedjavaprogrammingbyuttamkumarroy-pdf
7.	https://www.edureka.co/blog/advanced-java-tutorial

Code:BCECCE5103	Information System Security	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Use current techniques, skills, and tools necessary for Information Systems and Technology.
- Apply a good working knowledge of communication in Security Management.
- Illustrate the Security Architecture and demonstrate its requirements.
- Analyze and experience good knowledge of Laws.
- Evaluate the importance of Physical Security and its implementation techniques.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Information Security**	**07**
2.	**Encryption and Authentication Techniques.**	**08**
3.	**Risk Management**	**08**
4.	**Internet Security.**	**07**
5.	**Network Security**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Information Security**
	• Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Services and mechanisms, Conventional Cryptographic Techniques: Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography . • Conclusion of the Unit
2.	**Encryption and Authentication Techniques.**
	• Symmetric and Asymmetric Cryptographic Techniques : DES, AES, RSA algorithms, International Data Encryption Algorithm (IDEA), Digital Certificates, Private Key Management, The PKIX Model Authentication and Digital Signatures • Conclusion of the Unit
3.	**Risk Management**
	• Key management – Kerberos, Program Security : Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels • Conclusion of the Unit
4.	**Internet Security.**
	• Internet Security Protocols: Introduction, Basic Concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL Versus SET, 3D Secure Protocol, Electronic Money, Email Security Wireless Application Protocol (WAP) Security • Conclusion of the Unit
5.	**Network Security**
	• Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME • Conclusion of the Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Information Security Risk Analysis	Thomas R.Peltier	Third Edition,	Pub:Auerbach,2012
2.	Mark Stamp's Information Security: Principles and Practice (WIND)	DevenN.Shah, Wiley(2009)	2009	Wiley

3.	Information Systems Security: Security Management, Metrics, Frameworks and Best Practices	NinaGodbole,	2008	Wiley
Reference Book				
1.	Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education			
2.	Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson			
3	Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.			
Online Resources				
1.	https://www.sans.org/cyber-security-courses/introduction-cyber-security/			
2.	https://nptel.ac.in/courses/106106129			

Practical

Code: BCECCE5201 Design & Analysis of Algorithms Lab 1 Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- To apply divide and conquer method to implement quick sort, merge sort, linear search, Binary search in C.
- Implement job sequencing using greedy method.
- Find the minimum cost of spanning tree.
- Implement the dynamic programming using branch and bound method.
- Implement the NP-Hard, NP-.Complete problem.

A. LIST OF EXPERIMENTS:

1	Write a C program to implement the Stack using arrays. Write Push(),Pop(), and Display()methods to demonstrate its working.
2	Write a C program to sort a list of elements using the quick sort algorithm. The elements can be read from a file.
3	Write a C program to implement a Merge sort algorithm to a list of elements for different values of n and determine the time required to sort the elements.
4	Find the minimum cost of spanning tree in C using Prim's algorithms.
5	Find the minimum cost of spanning tree in C using Kruskal's algorithm.
6	Implement 0/1 Knapsack problem using Dynamic Programming in C.
7	Write a C program to find the shortest paths between nodes in a graph using Dijkstra's algorithm.
8	Write a C program Print all the nodes reachable from a starting node in a digraph using BFS method. Check whether a graph is connected or not using DFS method.
9	Write a C program to implement all pairs shortest paths problem using Floyd's algorithm.
10	Write a C program to implement N Queen's problem using Back Tracking.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Mastering Algorithms with C	Kyle Loudon	Latest	O'Reilly
2.	Algorithms Illuminated (Part 3): Greedy Algorithms and Dynamic Programming	Tim Roughgarden	Kindle	
Reference Book				
3.	Data Structures And Algorithms Made Easy Narasimha Karumanchi kindle Edition			
Online Resources				
4.	https://www.sanfoundry.com/c-program			
5.	https://www.thecrazyprogrammer.com/2015/03/c-program-for-n-queens-problem-using-backtracking.html			

Code: BCECCE5202	Advance Java Lab	1 Credit	[LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Develop dynamic web application
- Develop database application using hibernate
- Develop IOC and DI using springs
- Develop web application using springs.
- Identify where and when to use MVC design pattern Create custom tag in JSP

A. LIST OF EXPERIMENTS:

1	Develop dynamic web application to display current system date and time using servlets
2	Develop dynamic web application to display login page with proper HTML UI elements using servlets.
3	Implement a servlet to authenticate login details, which is created previously (user name and password should be accepted using HTML and displayed using a Servlet)
4	Develop dynamic web application to manage product (prod Id, name, category, price) details using servlets. This app must have following pages a. Home page b. Product adding page c. Product editing page d. Product displaying page
5	Develop dynamic web application to manage product (prodId, name, category, price) details using servlets. This app must have following pages a. Home page b. Product adding page c. Product editing page d. Product displaying page
6	Write JSP program to implement custom tag with name <product>, which display product (prodId, name, category, price) details
7	Enhance previous JSP program to fetch data from database
8	Develop Rich Internet Applications to manage product and user details using struts and database
9	Develop Hibernate application to manage product details like insert, update, delete and display from database using HQL
10	Develop Spring based dynamic web application to manage courses, students in a college environment using Web MVC framework and JDBC
11	Transfer a file from one system to another system by the network
12	Develop Chat Server using Java.

B.. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Advanced Java Programming	B.Prasanalakshmi	1st	CH Publishers
2.	Advanced Java Programming	Uttam K Roy	1st	Oxford University Press
3.	Advanced Java Technology -A Conceptual Approach	A.A.Puntambekar	1st	Technical Publications
Reference Book				

4.	Advanced Java Coding Problems: Best Advanced Coding Problems with Explanation and Solutions, by Pratap Divyansh
5.	Advanced Java Optimization Techniques, by Jason Arnold
Online Resources	
6.	https://www.simplilearn.com/resources-to-learn-java-programming-article
7.	https://www.docdroid.net/mY1yTPu/advancedjavaprogrammingbyuttamkumarroy-pdf

Minor Stream Courses

Code: BADCCE5101 **RPA TOOL** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Able to Record, Play and Installing UiPath studio
- Apply various data manipulation on different file format
- Implement User Interface Components in UiPath
- Implement codes in Reinforcement Learning
- Applu in real word applications

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Robotic Process Automation concepts**	**8**
2.	**Sequence and Data Manipulation**	**8**
3.	**Overview of UiPath**	**7**
4.	**Control Flow Activities and Selectors**	**7**
5.	**Automation**	**6**

D. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Robotic Process Automation concepts**
	• Introduction to Unit • Introduction to RPA: Scopes and techniques of RPA, About UiPath, The future of automation • Record and Play: Record and Play, UiPath stack, Installing and Learning UiPath studio, Task recorder • Conclusion of unit
2.	**Sequence and Data Manipulation**
	• Introduction to Unit • Sequence: Sequence, Flowchart and Control Flow, sequencing the workflow, control flow, various types of loops and decision making, step by step example using sequence, Flowchart and Control Flow. • Data Manipulation: Variables and scope, Collections, Arguments, Collections, Clipboard management, File operation, CSV/Excel to data table and vice versapass, break, else. • Conclusion of Unit
3.	**Overview of UiPath**
	• Introduction to Unit • User Interface Components: Ribbon, Toolbars Access, Library panel, project panel, Outline panel, locals panel, Debugging, Recording, Workflow execution, context menu, properties panel, Designer panel, Universal search bar. • Workflow Design and UiPath Studio: Layout diagrams, Type of Decisions, switch activity, Flow Decision, Flow switch, Naming conventions, managing variables in studio, types of variables, Managing arguments, Argument panel, Types of recording, Automatic recording, Basic, web and desktop automatic recording, Manual recording, Data scraping, Screen scrapping and its methods. • Conclusion of Unit
4.	**Control Flow Activities and Selectors**
	• Introduction of Unit • Control Flow Activities and Selectors: Assign activity, Delay activity, While activity, Do while activity, If activity, Switch activity, For each activity and Break activity. • Selectors and input/output methods: Simple selectors, Generation of Dynamic selectors, passing the variables in selectors, Input methods, Output methods, Full text, Native, OCR. Built-In Class Attributes • Conclusion of Unit
5.	**Automation**
	• Introduction of Unit • Excel and PDF Automation: Reading and working with rows of excel, Looping with excel, Working with PDF and excel files, retrieving data from web. • Email Automation: Outlook Email activity, Get IMAP mail activity, Get POP3 mail message, get exchange mail activity, sending and receiving mail messages. • Orchestrator: Dashboard, Robots, Processes, Jobs, Queues, Schedules, Transaction clause regular expressions • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Learning Robotic Process Automation with UiPath	Alok Mani Tripathi	Latest	Packt
2	Intelligent Control: A stochastic optimization approach	Amitava Chatterjee, Anjan Rakshit, and Kaushik Das Sharma	Latest	Springer edition
3	Learning Robotic Process Automation with UiPath	Alok Mani Tripathi	Latest	Packt
Websites				
https://www.uipath.com/ https://www.udemy.com/course/robotic-process-automation/				

Code: BADCCE5102	R Programming	3 Credits [LTP: 3-0-0]

COURSE OUTCOME:

Students will be able to:

- Get familear with R environment, installation process and packages
- Create simple program using data structure and control statements
- Create a simple application using input output operations and string manupulation functions.
- Generate summary reports as per given statistics and parametric testing for decision making
- Create a visualization report using Graps in R. Exposer to non-parametric testing of hypothesis in R

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to R Environment**	**6**
2.	**Data Structures and Control Statements**	**8**
3.	**I/O operations and String Manipulations**	**7**
4.	**R for Summary Statistics and Parametric Tests**	**8**
5.	**R for Graphs, Nonparametric Tests and ANOVA**	**7**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to R Environment**
	• History and development of R Statistical computing programming language. • Installing R and R studio. • Getting started with R. • Creating new working directory. • Changing existing working directory. • Installing the available packages. • Calling the installed packages, • Variable definition in R. • Simple functions, vector definition and logical expressions • Matrix calculation and manipulation using matrix data types.
2.	**Data Structures and Control Statements**
	• Introduction to different data types, vectors, atomic vectors, types and tests, coercion, lists, list indexing, • Function applying on the lists, adding and deleting the elements of lists, attributes, name and factors, matrices and arrays, • Matrix indexing, filtering on matrix, generating a covariance matrix. • lapply( ) and sapply( ) on data frames, • Control statements.
3.	**I/O operations and String Manipulations**
	• Introduction to I/O functions in R • Using of scan( ), readline ( ) function, • Comparison and usage of scan and readline function, • Reading different format files into R: text file, CSV file • Statistical package files, xls and xlsx files. • Converting from one format to another using in built function, • Writing different file format in to the local machine directory, • Basics of string manipulations – grep ( ), nchar ( ), paste( ), sprintf( ), substr( ), regexpr( ), strsplit( ), • Testing of file name with given suffix.
4.	**R for Summary Statistics and Parametric Tests**
	• Descriptive statistics – summary statistics for vectors, making contingency tables, creating contingency tables from vectors. • Testing tables and flat table objects, cross tables, testing cross tabulation, recreating original data from contingency tables, switching class, mean (arithmetic, geometric and harmonic), • Median, mode for raw and grouped data, measure of dispersion – range, standard deviation, variance, coefficient of variation, testing of hypothesis – small sample test, large sample test – for comparing mean, proportion, variance (dependent and independent samples).
5.	**Testing of Hypothesis: Non - Parametric Test**
	• Introduction to graphs, • Box-Whisker Plot, Scatter plots, pairs plots, line chart, Pie Chart, • Bar Charts • Non-parametric test: The Wilcoxon U-Test (Mann-Whitney): One and Two-Sample U-Test, Tests for association: Chi Square Tests, • Yates Correction for 2X2 Tables, single category goodness of fit tests, • Analysis of Variance for one-way variation and two variation

E. RECOMMENDED STUDY MATERIAL:

Sr. No	Book	Author	Publication
1.	Beginning R: The statistical Programming Language	Dr. Mark Gardener	John Wiley & Sons, Inc.
2.	The art of R programming	Norman Matloff	no starch Press, San Francisco
3.	Introduction to Probability and Statistics for Engineers and Scientists	Owen Jones, Robert Maillardet and Andrew Robinson	CRC Press
4.	The R Book	Hadley Wickham	CRC Press
5.	Advanced R	Ken Black	Sixth Edition, John Wiley & Sons, Inc.

Code: BADCCE5201	RPA TOOL Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Implement sequence using activity in UiPath Studio
- Implement the screen scrapping using UiPath Studio
- Implement data manipulation on various file format
- Design automation techniques on various file formats and email
- Apply real world application through automation.

A. LIST OF EXPERIMENTS:

1	Install UiPath Studio and record a task.
2	Implement sequence in UiPath Studio.
3	Implement flowchart in UiPath Studio.
4	Implement sequence using the Assign activity, Do While activity, Delay activity, If activity.
5	Implement sequence using the Switch activity, While activity, For Each activity, Break activity.
6	Generate dynamic selector and pass the variables in selectors.
7	Implement and run example of screen scrapping through UiPath Studio.
8	Manipulate a set of data using UiPath Studio / Excel.
9	Set up and automate Excel and PDF through UiPath Studio.
10	Set up and automate Email using UiPath Studio.
11	Enable and implement text based automation using UiPath Studio.
12	Organize a process through orchestration using UiPath Studio.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Robotic Process Automation-Guide to building robot	Richard Murdoch	1st Edition	
2.	Robotic Process Automation and Risk Mitigation: The Definitive Guide	Mary C. Lacity and Dr. Leslie P. Willcocks		SB Publishing, 2017
3.	Introduction to robotic process automation	Frank Casale		Institute for Robotic Process Automation,

				2015
Reference Book				
1.	“Learning Robotic Process Automation with UiPath” by Alok Mani Tripathi, Packt			
2.	“The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems” by Tom Taulli, Apress, 2020			
Online Resources				
•	https://www.uipath.com/			
•	https://www.udemy.com/course/robotic-process-automation/			

Code: BADCCE5202	R Programming lab	1 Credit	[LTP: 0-0-2]

A. List of Programs

Part A	
	1. Install and configure R, set working directory. 2. Install Packages and calling installed packages 3. R studio environment and functionalities of R studio 4. Implement basic R operations (data input, missing values, importing data into R using different formats : xlsx, CSV, Text files) 5. Use R as a calculator 6. Explore various functionalities of dataframes. 7. Create data set using data frames, list and tables. 8. Create the contingency table for the given raw data. 9. Create the interactive user input code line in r using readline ( ) function. 10. Create the contingency table for the given vector format data. 11. Convert the contingency table to original format of the given data. 12. Analyse and give interpretation of summary statistics for the given data. 13. Calculate mean, median and mode for the grouped data and compare the results for the given data. 14. Analyse the given data for non-parametric tests and give the interpretations. 15. Use R for test the given data In order to compare the effectiveness of two sources of nitrogen, namely ammonium chloride (NH4Cl) and urea, on grain yield of Coarse cereal, an experiment was conducted. The results on the grain yield of Coarse Cereal (kg/plot) under the two treatments are given below. NH4Cl : 13.4, 10.9, 11.2, 11.8, 14.0, 15.3, 14.2, 12.6, 17.0, 16.2, 16.5, 15.7. Urea : 12.0, 11.7, 10.7, 11.2, 14.8, 14.4, 13.9, 13.7, 16.9, 16.0, 15.6, 16.0. Assess which source of nitrogen is better for Coarse Cereal.
Part B	
	16. Before an increasing in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increasing in duty, 800 people were tea drinkers in a sample of 1200 people. Using SE of a proportion, state whether there is a significant decrease in consumption of tea after the increase in the exercise duty. 17. Use R for test the given data A health status survey in a few villages revealed that the normal serum protein value of children in that locality is 7.0 g/100ml. A group of 16 children who received high protein food for a period of six months had serum protein values shown below. Can we consider that the mean serum protein level of those who were fed on high protein diet is different from that of the general population? S.No. (Child No.) 1 2 3 4 5 6 7 8 Protein level (g%) 7.10 7.70 8.20 7.56 7.05 7.08 7.21 7.25

S.No. (Child No.)	9	10	11	12	13	14	15	16
Protein level (g%)	7.36	6.59	6.85	7.90	7.27	6.56	7.93	8.56

18. Students were selected to training. Their performance was noted by giving a test and the marks recorded out of 50. They were given effective 6 months training and again they were given a test and marks were recorded out of 50.

Students	1	2	3	4	5	6	7	8	9	10
Before training	25	20	35	15	42	28	26	44	35	48
After training	26	20	34	13	43	40	29	41	36	46

By applying the t-test can it be concluded that the students have benefited by the training?

19. 100 individuals of a particular race were tested with an intelligence test and classified into two classes. Another group of 120 individuals belong to another race were administered the same intelligence test and classified into the same two classes. The following are the observed frequencies of the two races:

Race	Intelligence		
Intelligent	Non-intelligent	Total	
Race I	42	58	100
Race II	55	65	120
Total	97	123	220

Test whether the intelligence is anything to do with the race.

20. Obtain the correlation coefficient between the heights of father(X) and of the son (Y) from the following data

X	65	66	67	68	69	70	71	72
Y	67	68	65	68	72	72	69	71

And also test its significance. Using R functions.

21. Consider the inbuilt data set cars.
22. Find Correlation between possible variables and pairwise correlation
23. Find regression line between appropriate variables
24. Display the summary statistics and comment on the results

Code:BUACHU5218	Professional Skills-I	1 Credit	[LTP: 0-0-2]

CO1: Compare the professional and personal approach towards any task and demonstrate their understanding by displaying professional attitude in the assigned tasks.
CO2: Recognize, explain, and use the formal elements of specific genres of organizational communication: reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents etc...
CO3: Prepare and deliver a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.
CO4: Demonstrate preparedness for any type of interview from classic one-on-one interview to panel interviews, Phone/Skype interviews, Behavioral/Situational etc. along with sharping the ability to critically analyze a given piece of information and collectively work in a group to arrive at a solution or develop a perspective.
CO5: Understand negotiation and time management to identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargaining to closing.

UNIT NO.	UNIT NAME	HOURS
1	**Professional Attitude & Approach**	6
2	**Professional Writing-I**	8
3	**Presentation Skills: Structure Study**	2
4	**Interview Skills & Group Discussion**	4
5	**Negotiation Skills & Time Management**	4

LIST OF LABS	
1.	Professional & Ethical Approaches: Degree of adherence, Business world & meeting deadlines
2.	Job Hunting and Networking: Skill Branding & Usage of Online Platforms
3.	Trust Building & Cultural Etiquettes
4.	Professional Writing-I: Direct-Indirect approaches to Business Writing-Five main stages of writing Business Messages.
5.	Professional Email Writing
6.	Resume Building-I: Difference between C.V. & Resume, formats, points to cover, practice sessions
7.	E-Learning & E-Content Development-I
8.	Presentation Skills: format & structure of presentations, using tools & techniques
9.	Job Interviews I: Preparation and Presentation
10.	Advanced Group Discussion – I
11.	Negotiation Skills & and Conflict Resolution-I
12.	Professional Code of Ethics & Effective Time Management

Code: BULCSE5201	Skill Enhancement Generic Course-V	1 Credit	[LTP: 0-0-2]

COURSEOUTCOMES:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

LIST OF LABS	
1	Problems on Age, Cause & Effect
2	Career Development, Stress Management
3	Conflict Management, Data Interpretation
4	Sitting Arrangements
5	Written Communication, Behavioral interview skills
6	Error Detection, Confusing words
7	Number series, Speed, Time & distance
8	Linear Equations, Points, lines & angles
9	Allegations & Mixtures, Data sufficiency
10	Articles & Prepositions, Modal Verbs & Conditional Tense
11	Pronouns, Adverbs & Adjectives, Emotional Intelligence
12	Managing pressure & maintaining balance

VI SEMESTER

MajorCoreCourses

Code: BCECCE6101	Big Data Analytics	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Provide HDFS Concepts and Interfacing with HDFS
- Access and Process Data on Distributed File System
- Manage Job Execution in Hadoop Environment
- Explain the components of Hadoop and Hadoop Eco-System
- Apply Machine Learning Techniques using R

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction to Big Data And Hadoop	07
2.	HDFS(Hadoop Distributed File System)	08
3.	Map Reduce	08
4.	Hadoop Eco System	07
5.	Data Analytics with R	07

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Big Data And Hadoop**
	• Introduction of Unit • The Design of HDFS, HDFS Concepts, Command Line Interface, • Hadoop file system interfaces, Data flow, • Data Ingest with Flume and Scoop and Hadoop archives, • Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures • Conclusion of Unit
2.	**HDFS (Hadoop Distributed File System)**
	• Introduction of Unit • The Design of HDFS, HDFS Concepts, Command Line Interface, • Hadoop file system interfaces, Data flow, • Data Ingest with Flume and Scoop and Hadoop archives, • Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures • Conclusion of Unit
3.	**Map Reduce**
	• Introduction of Unit • Anatomy of a Map Reduce Job Run, Failures, • Job Scheduling, Shuffle and Sort, • Task Execution, Map Reduce Types and Formats, Map Reduce Features. • Conclusion of Unit
4.	**Hadoop Eco System**
	• Introduction of Unit • Pig : Introduction to PIG, Execution Modes of Pig, • Comparison of Pig with Databases, Grunt, Pig Latin, • User Defined Functions, Data Processing operators. Hive : Hive Shell, • Hive Services, Hive Metastore, Comparison with Traditional Databases, • HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. • Big SQL : Introduction • Conclusion of Unit
5.	**Data Analytics with R**
	• Introduction of Unit • Machine Learning: Introduction, Supervised Learning, • Unsupervised Learning, Collaborative Filtering, • Big Data Analytics with BigR, • Conclusion with R

E. **RECOMMENDED STUDY MATERIAL**

S. No	Text Books:	Author	Edition	Publication
1.	Hadoop: The Definitive Guide	Tom White	Third Editon	O'reily
2.	Big Data Analytics	Seema Acharya, Subhasini Chellappan	2015	Wiley
Reference Book				
1.	Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.			
2.	Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)			
3.	Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R			
Online Resources				
1.	http://www.bdbanalytics.ir/media/1121/big-data-analytics_turning-big-data-into-big-money.pdf			
2.	https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics			
3.	https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm			

Code: BCECCE6102 Computer Architecture 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Explain the organization of basic computer, its design and the design of control unit.
- Demonstrate the working of central processing.
- Describe the operations and language f the register transfer, micro-operations and input- output organization.
- Organize memory and memory management hardware.
- Elaborate advanced concepts of computer architecture, Parallel Processing, inter processor communication and synchronization.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Basics Of Digital Logics**	**8**
2.	**Register Transfer and Micro-operation**	**8**
3.	**Basic Computer Organization**	**8**
4.	**Micro Programmed Control Unit**	**6**
5.	**Computer Arithmetic**	**6**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basics Of Digital Logics**
	• Introduction of Unit • Number systems : Binary number system, Octal & Hexa-decimal number system, Conversion of Number System, r's & (r-1)'s, Binary arithmetic Operations, • Logic Gates: AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates. • Boolean algebra: AND, OR, Inversion, Basic Boolean Law's, Demorgan's theorem, Minimization techniques: K -Map, Sum of Product & Product of Sum,. • Conclusion & Real Life Application
2.	**Register Transfer and Micro-operation**
	• Introduction of Unit • Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer. • Logic Micro-operations: List of Logic micro operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit. • Conclusion &Real Life Application
3.	**Basic Computer Organization**
	• Introduction of Unit • Instruction Codes, Computer Registers: Common bus system, Computer Instructions • Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions. • Conclusion & Real Life Applications
4.	**Micro Programmed Control Unit**
	• Introduction of Unit • Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines. • Central Processing unit: Introduction of CPU. • Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, • Associative Memory, Cache Memory, Virtual Memory • Conclusion & Real Life Application
5.	**Computer Arithmetic**
	• Introduction of Unit • Modes of Data Transfer: Priority Interrupt, Direct Memory Access, • Introduction, Addition and Subtraction, • Multiplication Algorithms (Booth algorithm), Division Algorithms, • Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors. • Conclusion &Real Life Application

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Computer SystemArchitecture	MorrisMano	PHI	
2.	ComputerOrganizationand Architecture	WilliamStallings	PHI	
Reference Book				

1.	Digital Computer Electronics: An Introduction to Microcomputers, Malvino, TMH
2.	PC Hardware in a Nutshell Barbara Fritchman Thompson, Robert Bruce, Thompson, O'Reilly, 2nd Edition , 2010
3.	Fundamentals of Computer Organization and Architecture, Mostafa AB-EL-BARR and Hesham EL-REWNI by John Wiley and Sons
Online Resources	
1.	https://www.javatpoint.com/computer-organization-and-architecture-tutorial

Code:BCECCE6103	Sales Force	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Understand the fundamental concepts and components of the Salesforce platform.
- Develop proficiency in using Salesforce tools and features for sales, marketing, and customer relationship management.
- Gain practical skills in configuring and customizing Salesforce to meet specific business needs.
- Learn to leverage Salesforce reporting and analytics capabilities for data-driven decision-making.
- Acquire knowledge of best practices for Salesforce administration and user management.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1	**Introduction to Salesforce**	07
2	**Salesforce Configuration and Customization**	08
3	**Salesforce Sales and Marketing Automation**	08
4	**Salesforce Data Management and Analytics**	07
5	**SalesforceAdministration and User Management.**	07

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Salesforce**
	• Overview of the Salesforce platform and its capabilities. • Introduction to Salesforce editions and licenses. • Exploring the Salesforce user interface and navigation. • Understanding Salesforce data model: objects, records, and relationships. • Introduction to key Salesforce features: accounts, contacts, leads, and opportunities.
2.	**Salesforce Configuration and Customization**
	• Customizing Salesforce layouts, fields, and page layouts. • Creating custom objects and relationships. • Configuring validation rules, workflows, and process automation. • Introduction to Apex triggers and custom development. • Integrating external systems with Salesforce using APIs.
3.	**Salesforce Sales and Marketing Automation**
	• Implementing Salesforce sales processes and methodologies. • Managing leads, opportunities, and sales pipelines. • Utilizing Salesforce automation tools: workflow rules, process builder, and approval processes. • Introduction to Salesforce marketing automation: campaigns, email templates, and lead scoring. • Tracking and analyzing sales and marketing performance with Salesforce reports and dashboards.
4.	**Salesforce Data Management and Analytics**
	• Importing and exporting data in Salesforce. • Implementing data validation and de-duplication strategies. • Understanding Salesforce data security and access controls. • Building custom reports and dashboards for data analysis. • Leveraging Salesforce Einstein Analytics for advanced data visualization and insights.
5.	**SalesforceAdministration and User Management.**
	• Managing Salesforce users, profiles, and permissions. • Implementing role hierarchies and sharing rules. • Monitoring and maintaining data quality in Salesforce. • Performing system audits and troubleshooting common issues. • Best practices for managing Salesforce releases and upgrades.

D. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Salesforce CRM: The Definitive Admin Handbook"	Paul Goodey	5th Edition	Packt Publishing
2.	Salesforce Essentials for Administrators	Mohith Shrivastava and Vivek Deepak	3rd Edition	Apress
Reference Book				

3.	"Mastering Salesforce CRM Administration" by Rakesh Gupta and Sagar Pareek 4th EditionPackt Publishing
Online Resources	
1.	https://trailhead.salesforce.com/
2.	https://help.salesforce.com/
3.	https://www.linkedin.com/learning/topics/salesforce

Practical

Code: BCECCE6201	Big Data Analytics Lab	1 Credit	[LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Identify the key issues in big data management and experiment with Hadoop framework.
- Develop problem solving and critical thinking skills in Hadoop.
- Develop problem solving and critical thinking skills in Map Reduce.
- Construct and Explain with structure and unstructured data by using NoSQL commands.
- Implement fundamental enabling techniques and scalable algorithms for data stream mining

A. LIST OF EXPERIMENTS:

1	Hadoop Installation: Ubuntu & THEL 9 Operating System in stand-alone mode
2	File Management tasks in Hadoop
3	Implement the following Data structures in Java: Linked Lists, Stacks, Queues, Set, Map
4	Word Count Map Reduce program to understand Map Reduce
5	Implement the following file management tasks in Hadoop: Adding files and directories Retrieving files Deleting files
6	Implement Matrix Multiplication with Hadoop Map Reduce
7	Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8	Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes
9	Weather Report POC-Map Reduce Program to analyses time-temperature statistics and generate report with max/min temperature.
10	Implementing Matrix Multiplication with Hadoop Map Reduce
11	Pig Latin scripts to sort, group, join, project, and filter your data.
12	Hive Databases :Tables, Views, Functions and Indexes

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Hadoop in Practice	Alex	2014	
2.	Big Data	Holmes	2016	Black Book
3.	Big Data and Hadoop	V.K. Jain	2017	
Reference Book				
1.	Hadoop Practice Guide,"Jisha Mariam Jose"			
2.	Hadoop: The Definitive Guide ,"Tom White",O'Relly			
Online Resources				
1.	https://ia600201.us.archive.org/7/items/HadoopInPractice/Hadoop%20in%20Practice.pdf			

Code:BCECCE6202	Sales Force Lab	1 Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Understand the key features and components of the Salesforce platform.Navigate the Salesforce user interface and explore different objects and records.
- Practice customizing Salesforce layouts, fields, and page layouts.Create and modify custom objects and relationships.
- Implement workflow rules to automate routine tasks in Salesforce.Configure process builder and approval processes for streamlined workflows.
- Import and manage data in Salesforce, ensuring data integrity.Create custom reports and dashboards to analyze Salesforce data.
- Develop Apex triggers for customizing Salesforce behavior.
- Integrate Salesforce with external systems using APIs.

A. LIST OF EXPERIMENTS:

1	Navigate through the Salesforce user interface and understand the different objects and records.
2	Practice customizing Salesforce layouts, fields, and page layouts. Create custom objects and relationships in Salesforce.
3	Implement workflow rules to automate business processes in Salesforce. Configure process builder and approval processes for streamlined workflows.
4	Import sample data into Salesforce and ensure data integrity. Perform data deduplication and validation techniques.
5	Create custom reports and dashboards to analyze Salesforce data. Apply filters, groupings, and summarize data in reports.
6	Manage user profiles, roles, and permissions in Salesforce. Implement sharing rules and define data access controls.
7	Set up a Salesforce campaign to track and manage marketing activities. Create email templates and monitor campaign performance.
8	Learn the basics of Apex triggers and their role in customizing Salesforce behavior. Write and deploy a simple Apex trigger for a specific use case.
9	Implement more complex Apex triggers or classes to address specific business requirements. Test and debug Apex code using Salesforce Developer Console.
10	Build a custom Lightning app using the Lightning App Builder. Customize the app's components and layout to meet specific needs.
11	Integrate Salesforce with an external system using APIs
12	Send and receive data between Salesforce and the external system

Minor Stream Courses

Code:Code:BADCCE6101 Deep Learning & Computer Vision 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Understand the foundational concepts of deep learning and its applications in computer vision, enabling students to grasp the underlying principles of convolutional neural networks (CNNs) and their architecture.
- .Develop practical skills in implementing and training deep learning models for image classification, enabling students to build accurate classifiers for different visual recognition tasks.
- Gain proficiency in object detection techniques, allowing students to create systems capable of identifying and localizing multiple objects within images.
- Acquire expertise in semantic segmentation, enabling students to perform pixel-wise image segmentation for advanced computer vision tasks like medical image analysis.
- Master face detection and tracking algorithms, empowering students to design real-time systems capable of detecting and tracking faces in video streams.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Deep Learning basics for computer Vision	8
2.	Image Classification	8
3.	Object Detection	7
4.	Semantic Segmentation	8
5.	Face detection and tracking	8

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Deep Learning basics for computer Vision**
	• Introduction to Unit • Introduction to deep learning and its applications in computer vision. • Fundamentals of convolutional neural networks (CNNs) and their architecture. • Activation functions, pooling layers, and regularization techniques for CNNs. • Optimizers and loss functions for training deep learning models. • Hands-on implementation of a basic image classification model • Conclusion of unit
2.	**Image Classification**
	• Introduction to Unit • Understanding image classification tasks and dataset preparation. • Training deep learning models for image classification with various architectures. • Fine-tuning pre-trained models for custom classification tasks. • Evaluating model performance using metrics like accuracy and confusion matrix. • Project: Building an image classification system for a specific domain • Conclusion of unit
3.	**Object Detection**
	• Introduction to unit • Introduction to object detection and its applications. • Region-based CNNs (R-CNN), Fast R-CNN, and Faster R-CNN for object detection. • Single Shot Multibox Detector (SSD) and You Only Look Once (YOLO) for real-time detection. • Handling multi-class object detection and overlapping objects. • Project: I • Conclusion of unit
4.	**Semantic Segmentation**
	• Understanding semantic segmentation and its importance in computer vision. • Fully Convolutional Networks (FCNs) for pixel-wise image segmentation. • U-Net architecture for medical image segmentation and other applications. • Evaluating segmentation models using metrics like Intersection over Union (IoU). • Project: Building a semantic segmentation model for a specific use case
5.	**Face detection and tracking**
	• Introduction to face detection and tracking algorithms. • Haar Cascades for face detection and Viola-Jones algorithm. • Deep learning-based face detection using Single Shot Multibox Detector (SSD) and RetinaNet. • Face tracking techniques using Kalman filters or correlation-based tracking. • Project: Developing a real-time face detection and tracking system.

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	"Deep Learning for Computer Vision"	Rajalingappaa Shanmugamani	Latest	Packt Publishing
2.	"Computer Vision: Algorithms and Applications"	Richard Szeliski	Latest	Springer
Reference Book				
1.	"Deep Learning"Author: Ian Goodfellow, Yoshua Bengio, and Aaron Courville Publisher: MIT Press			
Online Resources				
1.	https://www.javatpoint.com/deep-learning			
2.	https://www.simplilearn.com/tutorials/deep-learning-tutorial			

Code:BADCCE6102 Natural language Processing 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Identify the significance of natural language processing in solving real-world problems
- Implement POS tagging using HMM
- Apply Syntactic and Semantic Parsing methods
- Solve problems of sentimental analysis
- Apply deep learning models in NLP to solve real world problems

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1	**Introduction to NLP**	06
2.	**Language Modeling: N-gram and POS Tagging**	07
3.	**Syntactic and Semantic Parsing**	08
4.	**Text Analysis, Summarization and Extraction**	07
5.	**Deep Learning and NLP**	08

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to NLP**
	• Introduction to Unit • What is NLP? Why NLP is Difficult? • History of NLP, Advantages of NLP, Disadvantages of NLP • Components of NLP, Applications of NLP • The problem of ambiguity • Phases of NLP • NLP APIs • NLP Libraries • Difference Between Natural language and Computer language • Conclusion of unit
2.	**Language Modeling: N-gram and POS Tagging**
	• Introduction to Unit • Language Modeling with N-gram • Simple N-gram models, Smoothing (basic techniques) • Parts-of-speech Tagging • Rule based POS Tagging • TBL POS Tagging • POS tagging using HMM • Conclusion of Unit
3.	**Syntactic and Semantic Parsing**
	• Introduction to Unit • Basic concepts: top down and bottom up parsing Treebank. • Syntactic parsing: CKY parsing • Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs. • Vector Semantics; Words and Vector • Measuring Similarity; Semantics with dense vectors • SVD and Latent Semantic Analysis. • Embedding from prediction: Skip-gram and CBOW • Introduction to Word Net • Conclusion of Unit
4.	**Text Analysis, Summarization and Extraction**
	• Introduction of Unit • Sentiment Mining • Text Classification • Text Summarization, Information Extraction • Named Entity Recognition • Relation Extraction • Question Answering in Multilingual • Setting; NLP in Information Retrieval, Cross-Lingual IR • Conclusion of Unit
5.	**Deep Learning and NLP**
	• Introduction to Unit • Feature Extraction • Type of embedding • Word2Vec and Glove • Uses of deep learning models in NLP.

	• Sentiment analysis • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition	Jurafsky D. and Martin J. H	2nd	Upper Saddle River, NJ: Prentice-Hall, 2008
2.	Natural Language Processing with Python	Edward Loper, Ewan Klein, and	1st	Pearson Education
Reference Book				
1.	Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition			
2.	Computer Vision: Models, Learning, and Inference			
Online Resources				
1.	https://www.nlp.com/nlp-online-course/			
2.	https://www.futurelearn.com/courses/cloudswyft-msft-natural-language-processing-advanced			

Code:BADCCE6201	Deep Learning lab	1 Credits [LTP: 0-0-2]

A. LIST OF EXPERIMENTS:

1	Implement a basic CNN for image classification.
2	Train a CNN model on a custom image dataset.
3	Fine-tune a pre-trained CNN for new categories.
4	Build an object detection model using SSD.
5	Implement real-time object detection using YOLO.
6	Develop a semantic segmentation model using FCNs.
7	Implement U-Net for medical image segmentation.
8	Evaluate model performance using IoU and accuracy.
9	Build a face detection system using Haar Cascades.
10	Implement face detection with a deep learning model
11	Develop a face recognition system using embeddings.
3.	Implement face tracking using Kalman filters.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
3.	"Deep Learning for Computer Vision"	Rajalingappaa Shanmugamani	Latest	Packt Publishing
4.	"Computer Vision: Algorithms and Applications"	Richard Szeliski	Latest	Springer
Reference Book				
2.	"Deep Learning"Author: Ian Goodfellow, Yoshua Bengio, and Aaron Courville Publisher: MIT Press			
Online Resources				
3.	https://www.javatpoint.com/deep-learning			
4.	https://www.simplilearn.com/tutorials/deep-learning-tutorial			

Code:BADCCE6202 Natural language Processing lab 1 Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Create systems for various NLP problems with moderate complexity.
- Implement various NLP software libraries and data sets publicly available.
- Implement semantics and pragmatics of English language for text processing
- Implement real time applications of computer vision.
- Design and develop practical and innovative image processing and computer vision applications or systems

A. LIST OF EXPERIMENTS:

1	Write a program to tokenize the sentence into words for the further analysis (using Python Function)
2	Write a program to normalize the sentence to eliminate the unwanted punctuation, converting into lower caseor upper case of the entire document, expanding abbreviation, numbers into words and canonicalization
3	Write a program that splits the following string —Hello there SAMll into list and iterate over the list using 3different methods • List as a Iterable • Using Range
4	Convert the following sentence into tokens —NLP is Fun,you must learn it " into lowercase • Without splitting • With splitting
5	Write a program to Get the word cloud for the yelp Review data set
6	Write a program for Amazon review dataset to find the maximum number of words used. Get the output forthe frequently occurred word in the given data? And also visualize the test data.
7	Perform the sentiment analysis, classifying comments using various machine learning model on IMDBreview data set using BOW technique
8	Perform the sentiment analysis, classifying comments using various machine learning model on IMDBreview data set using TF-IDF technique.
9	Write a program to perform n-gram analysis on Amazon review data set and also compare result whileperforming different type of n-gram analysis on the given dataset
10	Write a program to perform name entity reorganization on the sentence given below "European authorities fined Google a record $5.1 billion on Wednesday for abusing its power in the mobile phone marketand ordered the company to alter its practices"
11	Write a program to perform email filtering on Spam Mails Dataset available on Kaggle.
12.	Write a program to perform survey analysis and the Dataset available is available on Kaggle.

S. No	Text Books:	Author	Edition	Publication
1.	Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition	Jurafsky D. and Martin J. H	2nd	Upper Saddle River, NJ: Prentice-Hall, 2008
2.	Natural Language Processing with Python	Edward Loper, Ewan Klein, and	1st	Pearson Education
Reference Book				
1.	Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition			
2.	Computer Vision: Models, Learning, and Inference			
Online Resources				
1.	https://www.nlp.com/nlp-online-course/			
2.	https://www.futurelearn.com/courses/cloudswyft-msft-natural-language-processing-advanced			

Code: BUACHU6223	Professional Skills-II	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES

Students would be able to:

CO1: Learn how to update and manage the experience, education, and skills & expertise sections on social media & formulate appropriate updates as a means to promote business activities.

CO2: Understand how to leverage grammar and formatting in formal documents & demonstrate how to follow the stages of the writing process .

CO3: Evaluate presentation's weak spots and areas for improvement & learn, practice and acquire the skills necessary to deliver effective presentation with clarity and impact.

CO4: Evaluate basic factors such as personal skills & abilities, career fields, willingness to learn and strengthen the chances to get desirable jobs.

CO5: Understand negotiation and team skills dynamics and how to prepare for uncertainty & learn to craft agile strategy and be quick on your feet in changing circumstances.

UNIT NO.	Title of the Unit	Time required for the Unit (Hours)
1	**Personal Branding**	2
2	**Professional Writing-II**	8
3	**Presentation Skills: Professional Setting**	2
4	**Job Interview & Group Discussion: Preparation by Mock Practice**	4
5	**Negotiation Skills, Team Management & Professional Awareness**	8

LIST OF LABS	
1.	Personal Branding: Its best practices
2.	Professional Writing II: Abstract Writing, Statement of purpose and other formal documents
3.	Expanding Professional Vocabulary
4.	Resume Building-II: Revising & Updating
5.	E-Learning & E-Content Development-II
6.	Presentation Skills in Professional Setting
7.	Job Interviews II: Preparation and Presentation for Mock Interviews
8.	Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics
9.	Negotiation Skills & and Conflict Resolution-II
10.	Change and Transition Management
11.	Team Building Strategies: Project Management
12.	Career Awareness & Productive Mindset

Code:BULCSE6201	Skill Enhancement General Courses-VI	1 Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Understand basic problems based on arithmetic and soft skills area which are asked in aptitude test taken by companies
- Effectively solve these problems by applying the knowledge earned.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self-motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality

LIST OF ACTIVITIES	
1	Work & Wages, Ratio & Proportions
2	Effective Communication and Managing Conflict, Story telling
3	Heights & Distances, Probability
4	Comprehension & Para Jumble
5	Written Communication, Behavioral Interview Skills
6	Effective Presentation skills, How to become more approachable
7	Odd one out, Order & Ranking
8	Deductive Reasoning, Divergent Thinking
9	How to brainstorm effectively, Mirror & Water images
10	Mind Mapping, Closing deals
11	Project Management, Team Management
12	Emotion Management, Delivering constructive feedback

VII SEMESTER

Mejor Core Courses

Code:BCECCE7101 Data Mining Techniques and Application 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Ability to understand the types of the data to be mined and present a general classification of tasks.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns, measurement and rule based data from large amounts of data.
- Choose and employ suitable data mining algorithms to build analytical applications.
- Comprehend the organization of data in the form of data warehouse and advanced concepts.

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Data Mining**	**07**
2.	**Classification**	**08**
3.	**Cluster Analysis**	**07**
4.	**Association Rule Mining and Visualization**	**08**
5.	**Data warehousing**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Data Mining**
	• Introduction to Data Mining • Data Mining Tasks • Components of Data Mining Algorithms • Data Mining supporting Techniques • Major Issues in Data Mining • Measurement and Data • Data Preprocessing • Data sets • Conclusion of Unit
2.	**Classification**
	• Introduction to Classification • Basic Concepts • Decision Tree induction • Bayes Classification Methods • Rule Based Classification • Model Evaluation and Selection • Techniques to Improve Classification Accuracy • Classification: Advanced concepts • Bayesian Belief Networks • Classification by Back Propagation • Support Vector Machine • Classification using frequent patterns. • Conclusion of Unit
3.	**Cluster Analysis**
	• Introduction to Cluster Analysis • Basic concepts and Methods • Partitioning methods • Hierarchical methods • Density Based Methods • Grid Based Methods • Evaluation of Clustering • Advanced Cluster Analysis: Probabilistic model based clustering, Clustering High Dimensional Data, Clustering Graph and Network Data, Clustering with Constraints. • Conclusion of Unit
4.	**Association Rule Mining and Visualization**
	• Introduction to Association Rule Mining • Large Item sets • Basic Algorithms • Parallel and Distributed Algorithms • Comparing Approaches • Incremental Rules • Advanced Association Rule Techniques • Measuring the Quality of Rules • Introduction to Visualization • Visualization of Multidimensional Data • Diagrams for Multidimensional visualization

	• Visual Data Mining • Data Mining Applications • Case Study: WEKA. • Conclusion of Unit
5.	**Data warehousing**
	• Introduction to Data warehousing • Data warehousing components • Multi dimensional data model • Data warehouse architecture • Data warehouse implementation • Mapping the data warehouse to multiprocessor architecture • OLAP • Need • Categorization of OLAP Tools • Introduction to Data Cube • Data Cube Technology: Efficient Methods for Data Cube Computation • Exploration and Discovery in Multidimensional Databases • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Data Mining Concepts and Techniques	Jiawei Han and Micheline Kamber	Third Edition	Elsevier
2.	Principles of Data Mining (Adaptive Computation and Machine Learning)	David J. Hand, Heikki Mannila and Padhraic Smyth	Latest	A Bradford Book
3.	Data Mining: Introductory and Advanced Topics	Margaret H Dunham	Latest	Pearson
Reference Book				
4.	Data Mining Concepts and Techniques, Author Jiawei Han and Micheline Kamber, August 2000			
5.	Principles of Data Mining (Adaptive Computation and Machine Learning), David J. Hand, Heikki Mannila and Padhraic Smyth			
6.	Data Mining: Introductory and Advanced Topics, Margaret H Dunham,Pearson			
Online Resources				
7.	https://www.educba.com/data-mining-concepts-and-techniques/			
8.	https://nptel.ac.in/courses/106105174			
9.	https://onlinecourses.swayam2.ac.in/cec20_cs12/preview			

Practical

Code: BCECCE7201 Data Mining Techniques and Application Lab 1 Credit [LTP: 0-0-2]

Course Outcome: -
Students will be able to:

- Know how to implement and demonstrate algorithms in WEKA
- Implement the concepts of data preprocessing & item construction in WEKA.
- Comprehend intermediate code generation, implement association rule process in WEKA.
- Implement classification and clustering algorithms in WEKA.
- Learn the concepts, global data flow analysis and efficient algorithm Visualize data in WEKA.

A. LIST OF EXPERIMENTS:

1	Demonstration of preprocessing on dataset student.arff
2	Demonstration of preprocessing on dataset labor.arff
3	Demonstration of Association rule process on dataset contactlenses. arff using aprioris algorithm
4	Demonstration of Association rule process on dataset test.arff using apriori algorithm
5	Demonstration of classification rule process on dataset student.arff using j48 Algorithm
6	Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7	Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8	Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9	Demonstration of clustering rule process on dataset iris.arff using simple k-means
10	Demonstration of clustering rule process on dataset student.arff using simple kmeans
11	Usage of WEKA for visualization of data set student.arff.
12	Usage of WEKA for visualization of data set employee.arff.

B. **RECOMMENDED STUDY MATERIAL**

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Data Mining Concepts and Techniques	Jiawei Han and Micheline Kamber	Third Edition	Elsevier
2.	Principles of Data Mining (Adaptive Computation and Machine Learning)	David J. Hand, Heikki Mannila and Padhraic Smyth	Latest	Springer
3.	Data Mining: Introductory and Advanced Topics	Margaret H Dunham	Latest	Pearson Education, 2006
Reference Book				
4.	Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber,Third Edition Elsevier			
5.	Principles of Data Mining (Adaptive Computation and Machine Learning), David J. Hand, Heikki Mannila and Padhraic Smyth			
6.	Data Mining: Introductory and Advanced Topics, Margaret H Dunham Latest,Pearson Education, 2006			

Online Resources	
7.	https://www.javatpoint.com/data-mining
8.	https://nptel.ac.in/courses/106105174

Code:BCECCE7202	Internet of Things (IoT) lab	1 Credits [LTP: 0-0-2]

Course Outcome: -
Students will be able to:

- Understand the fundamental concepts and principles of the Internet of Things (IoT)
- Gain practical skills in developing IoT applications using microcontrollers, sensors, and communication protocols
- Learn to design and implement IoT systems for various real-world scenarios, such as home automation, agriculture, and environmental monitoring.
- Develop proficiency in integrating IoT devices with cloud platforms and mobile applications for data collection, analysis, and visualization.
- Enhance problem-solving and critical thinking abilities through hands-on experimentation and troubleshooting in IoT projects.

A. LIST OF EXPERIMENTS:

1	LED Control via Smartphone App Use an Arduino or Raspberry Pi to control an LED using a smartphone app over Wi-Fi or Bluetooth
2	Temperature and Humidity Monitoring Build a temperature and humidity sensor using a microcontroller and display the data on an LCD or send it to a cloud platform
3	Home Automation System Create a smart home automation system using IoT devices to control lights, appliances, and security systems.
4	Smart Irrigation System Develop an IoT-based system that monitors soil moisture and weather conditions to automate the irrigation process.
5	Smart Health Monitoring Create a wearable IoT device to monitor vital signs like heart rate, blood pressure, and temperature, and transmit the data to a mobile app or cloud platform.
6	Smart Parking System Build a system that uses sensors to detect parking spot availability and notifies drivers via a mobile app or LED displays.
7	Air Quality Monitoring Design an IoT-based air quality monitoring system using gas sensors and display real-time data on a web dashboard.
8	Waste Management System Develop a smart waste management system that monitors garbage levels in bins and notifies waste collection teams when they need emptying.
9	Smart Energy Management Create an energy management system that monitors and controls energy consumption in buildings using IoT devices and data analytics.
10	Traffic Monitoring and Control System Develop a system that uses IoT devices to monitor traffic flow, control traffic signals, and provide real-time traffic updates to drivers.

Minor Stream Courses

Code:BADCCE7101 **Python For Time Series Data Analysis** **3 Credits [LTP: 3-0-0]**

COURSE OUTCOME

Students will be able to:

- Gain a strong foundation in time series analysis and learn how to handle, visualize, and explore time series data using Python, leveraging libraries like Pandas and NumPy.
- Acquire essential skills in time series preprocessing and feature engineering, including handling missing values, outliers, resampling, and generating meaningful lag features for improved forecasting.
- Develop proficiency in classical time series forecasting methods such as ARIMA and SARIMA, enabling students to build and evaluate accurate time series forecasting models using Python.
- Master machine learning-based time series forecasting techniques, including regression-based models and ensemble methods, to make predictions on time series data with Python.
- Explore advanced time series analysis using deep learning, including the implementation of RNNs and LSTMs, and apply these techniques to forecast and handle large-scale time series data efficiently using Python with libraries like TensorFlow or Keras

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1	**Introduction to Time Series Analysis**	**07**
2	**Time Series Preprocessing and Feature Engineering**	**08**
3	**Time Series Forecasting with Classical Methods**	**07**
4	**Time Series Forecasting with Machine Learning**	**08**
5	**Time Series Analysis with Deep Learning**	**07**

D. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Time Series Analysis**
	• Understanding the concept of time series data and its applications. • Basic time series data visualization and exploration techniques. • Handling datetime objects and time-indexed data in Python. • Time series decomposition: trend, seasonality, and residual components. • Introduction to popular time series libraries in Python (e.g., Pandas, NumPy).
2.	**Time Series Preprocessing and Feature Engineering**
	• Handling missing values and outliers in time series data. • Resampling and interpolation techniques for irregular time series. • Feature engineering for time series data (lag features, rolling statistics, etc.). • Time series differencing and transformation to achieve stationarity. • Implementing time series preprocessing using Pandas and NumPy.
3.	**Time Series Forecasting with Classical Methods**
	• Understanding classical time series forecasting methods (e.g., ARIMA, SARIMA). • Parameter tuning for ARIMA models using ACF and PACF plots. • Seasonal decomposition of time series for forecasting. • Evaluating forecast accuracy using metrics like RMSE and MAE. • Building and validating ARIMA models in Python.
4.	**Time Series Forecasting with Machine Learning**
	• Introduction to machine learning-based time series forecasting. • Feature selection and engineering for machine learning models. • Regression-based time series forecasting with linear and non-linear models. • Time series forecasting with ensemble methods (e.g., Random Forest, XGBoost). • Implementing machine learning-based time series forecasting in Python.
5	**Time Series Analysis with Deep Learning**
	• Introduction to deep learning-based time series forecasting. • Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks. • Time series forecasting using RNNs and LSTMs in Python (using libraries like TensorFlow or Keras). • Handling large-scale time series data with deep learning models. • Advanced topics in time series analysis: multivariate time series, attention mechanisms, and sequence-to-sequence models.

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	"Practical Time Series Analysis: Master Time Series Data Processing, Visualization, and Modeling using Python"	Aileen Nielsen	Latest	Apress
2.	"Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython"	Wes McKinney	Latest	O'Reilly Media
Reference Book				
1.	"Time Series Analysis and Its Applications: With R Examples" Robert H. Shumway, David S. Stoffer Publisher: Springer			
Online Resources				
1.	https://www.analyticsvidhya.com/blog/2021/07/time-series-forecasting-complete-tutorial-part-1/			
2.	https://www.datacamp.com/tutorial/tutorial-time-series-forecasting			
3.	https://www.kaggle.com/code/prashant111/complete-guide-on-time-series-analysis-in-python			

Code:BADCCE7102	Data Handling and Visualization	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Identify the types of data using statistical methods
- Create dataset in file format such as XML and JSON
- Apply data preprocessing techniques
- Create data visualization using various types of charts
- Apply visualization techniques for various data analytics tasks

A. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	—	—	—	—	—	—	—	—
CO-2	3	2	1	2	—	—	—	—	—	—	—	—
CO-3	2	3	2	1	—	—	—	—	—	—	—	—
CO-4	2	2	2	1	—	—	—	—	—	—	—	—
CO-5	2	3	1	1	—	—	—	—	—	—	—	—

B. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	—	—
CO-2	2	—	—
CO-3	1	—	—
CO-4	2	—	—
CO-5	2	—	—

C. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1	**Introduction to EDA**	07
2	**Data on files.**	06
3	**Cleaning the data, symbolic data analysis**	09
4	**Introduction to data visualization**	06
5	**Basics of data visualization**	07

D, DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to EDA**
	• Introduction to exploratory analysis • Introduction to statistics and data science • Central tendency (mean, mode, median). • Categorical data: Contingency tables, correspondence analysis • Review measurement scale • Properties of data • Conclusion of the Unit
2.	**Data on files.**
	• Introduction of Unit • Types of data formats • snowball sampling • for-mats XML and JSON formats • Conclusion of Unit
3.	**Cleaning the data, symbolic data analysis**
	• Introduction of Unit. • Cleaning and exploring the data. • Preparing data for basic regression and cluster analysis • Clustering problem • The foundation of symbolic data analysis • Clustering and optimization • Leaders method • Agglomerative method • Conclusion of Unit
4.	**Introduction to data visualization**
	• Introduction of Unit • Acquiring and Visualizing Data, Applications of Data Visualization • Keys factors of Data Visualization (Control of Presentation, Faster and Better JavaScript processing) • Exploring the Visual Data Spectrum • Charting Primitives (Data Points, Line Charts, Bar Charts, Pie Charts, Area Charts) • Conclusion of Unit
5	**Basics of data visualization**
	• Introduction • Reading Data from Standard text files • Basic Table Data (Building a table, Using Semantic Table, Configuring the columns) • Assuring Maximum readability (Styling your table, Increasing readability, Adding dynamic Highlighting) • Including computations Using data tables library • Relating data table to a chart. • Conclusion of Unit

E. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Visualizing data: Exploring andexplaining data with the processing environment	Ben Fry	Latest	O'Reilly
2.	Visual story telling with D3	Thomas D. Nadeau, Ken Gray Ritchie S. King	2015	Pearson
Reference Book				
1.	W.L. Martinez and A.R. Martinez. Exploratory Data Analysis with MATLAB, Chapman &Hall/CRC			
Online Resources				
1.	https://www.udemy.com/courses/search/?src=ukw&q=ASP.NET			
2.	https://www.tableau.com/learn/articles/data-visualization			

Code:BADCCE7201	Python For Time Series Data Analysis Lab	1 Credits [LTP: 0-0-2]

Course Outcome: -

Students will be able to:

- Gain practical experience in manipulating and exploring time series data using Pandas and NumPy.
- Acquire essential skills in preprocessing and feature engineering for time series forecasting.
- Develop proficiency in implementing classical time series models like ARIMA and SARIMA for accurate predictions.
- Master machine learning-based techniques for time series forecasting, including regression and ensemble methods.
- Explore advanced deep learning models like LSTM, attention mechanisms, and sequence-to-sequence models for time series analysis and forecasting.

A. LIST OF EXPERIMENTS:

1	Explore time series data using Pandas and NumPy.
2	Time Series Preprocessing - Handle missing values, resample, and interpolate time series data..
3	Feature Engineering - Generate lag features and transform data for forecasting.
4	ARIMA Modeling - Implement ARIMA and SARIMA models for time series forecasting.
5	Seasonal Decomposition - Decompose time series into trend, seasonality, and residual components.
6	Evaluating Forecast Accuracy - Evaluate forecasting performance using metrics like RMSE and MAE.
7	Regression-Based Forecasting - Apply linear regression for time series prediction.
8	Ensemble Methods - Use Random Forest and XGBoost for time series forecasting.
9	LSTM Implementation - Build LSTM networks for deep learning-based time series forecasting.
10	Multivariate Time Series - Handle and forecast multivariate time series data.
11	Attention Mechanisms - Implement attention mechanisms for improved forecasting.
12	Sequence-to-Sequence Models - Create sequence-to-sequence models for time series analysis.

B. **RECOMMENDED STUDY MATERIAL**

S. No	Text Books:	Author	Edition	Publication
1.	"Practical Time Series Analysis: Master Time Series Data Processing, Visualization, and Modeling using Python"	Aileen Nielsen	Latest	Apress
2.	"Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython"	Wes McKinney	Latest	O'Reilly Media
Reference Book				
1.	"Time Series Analysis and Its Applications: With R Examples" Robert H. Shumway, David S. Stoffer Publisher: Springer			
Online Resources				

1.	https://www.analyticsvidhya.com/blog/2021/07/time-series-forecasting-complete-tutorial-part-1/
2.	https://www.datacamp.com/tutorial/tutorial-time-series-forecasting
3.	https://www.kaggle.com/code/prashant111/complete-guide-on-time-series-analysis-in-python

Code:BADCCE7202 Data Handling and Visualization Lab 1 Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able:

- Apply fundamental data analytics techniques, using spreadsheet and database tools, to prepare, interpret on datasets.
- Identify the principles of visual perception.
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Implement data visualization methods to solve real world problems

A. LIST OF EXPERIMENTS:

<table>
<tr><td>1</td><td>Perform the Visualization of Spread sheet Models according to given requirement.
1. For the given data set that contains immigration details to Canada from 1980 to 2013,
• Create an area plot for top 6 immigrant countries from 1990 to 2013
• Create and year-wise immigrant bar chart from India to Canada during the period of 1980 to 2013.
• Create a box plot for Indian, Phillip in and China immigrants.
• Show the total no. of immigrants from India and France countries using Area Chart and Pie chart.
• Create a scatter Histogram for the immigrants from Fiji and Singapore in the year 2013.

LinkforDataSet-
https://www.un.org/en/development/desa/population/migration/data/empirical2/migrationflows.asp

2. Visualize the given Placement Data Full Class dataset that contains details about Campus Recruitment using the below techniques for appropriate dimensions and differentiate between the two techniques:
• Histogram and Bar Chart [For histogram let no. of bins=10]
• Facet Plot and Pair Plot
• Area Chart and Pie Chart [For yes or no data]</td></tr>
<tr><td>2</td><td>RDBMS Connectivity using Python
Find out output of the joint operation applied to the company database.
Apply inner join type to the following queries; apart from this apply other joins type to the first question.
• List the name of all employees who works for the research department.
• For every project located at ‘Stafford’ list the project number, the controlling Departmentt number and Departmentt manages last name.
• Find the name of all employees who works on the projects controlled by Dno=4.
• Make the list of project numbers for projects that involve an employee whose last name is‘ Jennifer’ as a worker or as a manager of the dept that controls the project.
• List the name of the employees who have no dependents.
• List the name of manager that have at least one dependent.</td></tr>
<tr><td>3</td><td>Visualization of Semi-Structured Data
1. Create a dictionary for the below data and convert the data into JSON.

<table>
<tr><th>S.NO</th><th>Name</th><th>Department</th><th>GPA</th><th>Future Preference</th></tr>
<tr><td>1</td><td>Amy</td><td>CSE</td><td>8.7</td><td>Placements</td></tr>
<tr><td>2</td><td>Rebekah</td><td>ECE</td><td>9.2</td><td>Higher Education</td></tr>
<tr><td>3</td><td>David</td><td>CSE</td><td>5.6</td><td>Higher Education</td></tr>
<tr><td>4</td><td>Sophia</td><td>CSE</td><td>6.8</td><td>Placements</td></tr>
<tr><td>5</td><td>Lucas</td><td>ECE</td><td>7.5</td><td>Placements</td></tr>
<tr><td>6</td><td>Andrew</td><td>CSE</td><td>8.9</td><td>Higher Education</td></tr>
<tr><td>7</td><td>Evan</td><td>CSE</td><td>7.9</td><td>Placements</td></tr>
<tr><td>8</td><td>Rose</td><td>CSE</td><td>8.7</td><td>Higher Education</td></tr>
</table>
</td></tr>
</table>

	9	Luis	ECE	7.2	Higher Education
	10	Blake	ECE	6.8	Higher Education
	11	Finn	CSE	7.2	Placements
	12	Alan	ECE	8.7	Placements
	13	Olivia	ECE	6.8	Higher Education
	14	Isabella	CSE	8.7	Placements
	15	Scarlett	ECE	6.8	Higher Education

using dump()method from JSON package.

i. Plot a graph showing the difference in Future Preferences of the students.
ii. Visualize the student's statistics based on the feature "Department".
iii. Plot a pie chart for the feature GPA.

2. For the below given data set which contains world population in json format:
https://query.data.world/s/uvvfp4usm2q4mlapbqtoi2stgunwda

iv. Read the data using pandas in column orient.
v. Using appropriate plotting technique visualize the given data on the basis of population feature.

4

Introduction to Tableau and Aggregation Methods in Any Data Visualization tool of your choice.
Connect the given Bus Safety dataset to Tableau and perform the below tasks on separate sheets.

i. Go to meta-data of the data set and change the column name form 'Date Of Incident' to 'Date' and 'Bus Garage' to 'Garage'.
ii. Visualize the no. of Incidents by different Operators and explore various possible charts.
iii. Show a pie chart depicting the age categories as Adult, Child, Elderly and Unknown and no. of incidents in each category.
iv. Show the statistics of Route No.'s in purple color Bar Chart.
v. Create a chart for 'Borough' feature depicting the total count of each and then sort it in ascending order.
vi. Depict the no. of incidents under the eight Incident Event Types for each of the Boroughs in the form of horizontal bar chart.

5

Visual Encodings and Basic Dash boards in Any Data Visualization tool of your choice

For the given dataset FIFA.csv that contains data about various football players, perform the following tasks on separate sheets:

i. After connecting the data use the data interpreter and clean the data.
ii. Create a horizontal bar chart to depict the International Reputation of various nations on an avg.
iii. Check if there is any relation between wage and position(left/right). If yes, describe the relation.
iv. Plot a bar chart against Avg. Heading Accuracy and Body Type. Find out which body type has highest and least accuracy.
v. Create a yellow colored Tree Chart to depict the total penalties of each nation and thus determine the highest and lowest.
vi. Using the above sheets create a dashboard and write an analysis report of what insights can be drawn from this.

6

Interactive Plots in Python
Using the in-built "Car Crashes" dataset from seaborn library perform the below tasks in order to depict interactive plots.
i. Create a sub-dataset df that contains 'total', 'speeding', 'alcohol' columns only.
ii. Visualize an interactive bar plot for df.
iii. Using bar iplot, display the mean of all columns in the original dataset.
iv. Visualize a scatter matrix plot for the dataset. (The scatter matrix plot is basically a set of all the scatter plots for numeric columns in your dataset)
v. Depict an interactive box plot for df.
vi. Show a histogram plot for df interactively.
vii. Visualize 3D iplot for the data and give your insights so as to why and when should 3D

	visualization be used.
7	Hierarchical and Topographical Data Visualizations in Any Data Visualization tool of your choice. Using the in-built data set from following link : https://www.bls.gov/cpi/tables/relative-importance/home.htm#Archived%20Relative%20Importance%20Data Find the suitable answer of following i. Develop a sunburst pie chart to visualize all items. ii. Create a tree map graph to display data in rectangular box iii. Display the data in hierarchical format using shankey diagram.
8	Calendar Heat maps Data Visualizations in Python i. Write a Pandas program to create a heat map (rectangular data as a color-encoded matrix) for comparison of the top 10 years in which the UFO was sighted vs each Month. ii. Load the dataset from "flight_dealy.csv" and create a heat map to show relationship between various fields of dataset.
9	Time Series Data Visualization in Python Collect the dataset from link https://github.com/Neelu-Tiwari/dataset/blob/main/stock_data.csv and perform the following task. i. Plot the changes that occurred in data over time. ii. Create a bar plot of month data for 2016 and 2017. iii. Perform the more practices from a. https://learnche.org/pid/data-visualization/data-visualization-exercises b. https://www.r-exercises.com/2017/04/10/forecasting-time-series-exploration-exercises-part-1/
10	Imagine that you work at one location of a retail department store chain. You're curious to see how the proportion of sales by product category at your particular store differs from the average of sales distribution numbers across all locations. Download the dataset from https://docs.google.com/spreadsheets/d/1VDG-ZpkkRaAituejvzIJ1Ky24LMpQfTN/edit#gid=416232713.
11	Select a member of the MIT aesthetics and computation research group (http://acg.media.mit.edu/). Briefly discuss that person's work and provide a review of the potential for that technique to help in information visualization (amount of information communicated vs. amount of aesthetics).
12	Given a census data set, describe three or more ways you might order the dimensions prior to visualization. What are the strengths and weaknesses of each? You may use the US County Census data set available on the book web site or at the http://www.openindicators.org web page.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Effective Data Storytelling: How to Drive Change with Data, Narrative, and Visuals	Brent Dykes	2018	
2.	Effective Data Visualization: The Right Chart for the Right Data	Stephanie D. H. Evergreen	2021	Evergreen Data & Evaluation, LLC
3.	The Visual Display Of Quantitative Information	Edward R.Tufte	2018	Amazon
Reference Book				
1.	"Information Dashboard Design: Displaying Data for At-a-glance Monitoring" by Stephen Few,O'Rellay			
2.	"The Accidental Analyst: Show Your Data Who's Boss" by Eileen and Stephen McDaniel, O'Rellay			
Online Resources				
1.	https://towardsdatascience.com/visualize-hierarchical-data-using-plotly-and-datapane-7e5abe2686e1			
2.	https://www.idvbook.com/index.html%3Fp=44.html			

Code:BUACHU7226	Comparative Literature Lab	1 Credits [LTP: 0-0-2]

COURSE OUTCOMES

Students would be able to:

CO1: Students should be able to distinguish between the writing structure used for a quantitative study and one used for a qualitative study

CO2: Build up a good command over the conventions with a good APA style for scholarly writing.

CO3: Define problems while writing research papers and citation methods.

CO4: Understand, analyze and effectively use various citation methods according to research patterns.

CO5: Develop their interest in designing original research drafts

Unit No..	Title of the Unit	Time required for the Unit (Hours)
1	**India and Vedic Tradition**	**8**
2	**Bengal and Indian Literature**	**2**
3	**Asian Literature**	**4**
4	**East and West Tradition**	**2**
5	**Translation and Adaptation**	**8**

LIST OF LABS	
1	*Natya Shastra; Bharat Muni Godan – Premchand*
2	Short Stories: Voikom Muhammod Basheer (Selected) Sadat Hasan Manto(Selected)
3	Novels: Chandrashekhar – Bankimchandra Chattopadhyay, Bener Meye – Haraprasad Shastri, Bindur Chele – Sharatchandra Chattopadhyay
4	Translations of Ramayana and Mahabharata in major Indian Languages
5	*Madhobi (Manipuri) – Kamal Singh*
6	The Moth-Eaten Howdah of a Tusker (Assamese)
7	*Selina Hossain – Nil Mayurer Joubon*
8	Tempest, Shakuntala and Rabindranath
9	W.B. Yeats and Indian Philosophy
10	T.S. Eliot, Romain Rolland and India
11	Kipling's "Kim", Rabindranath's "Gora", and Forster's "A Passage to India"
12	Amrita Pritam : Punjabi and English Translation

Code:BULCSE7201	Skill Enhancement Technical Courses-I Lab	1 Credits [LTP: 0-0-2]

A. LIST OF EXPERIMENTS:

1.	Introduction to Competitive Programming Overview of competitive programming and its significance in the IT industry Understanding the common programming contest platforms and their features (e.g., Codeforces, Topcoder, HackerRank) Introduction to algorithmic problem-solving techniques and strategies Familiarization with programming languages commonly used in competitive programming (e.g., C++, Java) Basic input/output operations and handling test cases
2.	Data Structures Review of fundamental data structures (arrays, linked lists, stacks, queues) Advanced data structures: trees (binary trees, binary search trees, heaps), graphs (representation, traversal algorithms), and hash tables Analyzing time and space complexities of data structures and their operations Implementing data structures from scratch and utilizing built-in libraries
3.	Algorithms and Problem Solving Understanding algorithmic paradigms: greedy, divide and conquer, dynamic programming. Sorting and searching algorithms (e.g., quicksort, mergesort, binary search) Graph algorithms: breadth-first search (BFS), depth-first search (DFS), shortest paths, minimum spanning trees. Dynamic programming: principles, memoization, tabulation Solving practice problems to reinforce algorithmic thinking
4.	Advanced Topics String manipulation algorithms (pattern matching, suffix trees, tries) Advanced graph algorithms: topological sorting, strongly connected components, network flow. Computational geometry: convex hull, line intersection, closest pair of points. Number theory: prime numbers, modular arithmetic, Euclidean algorithm. Utilizing advanced algorithms to solve competitive programming problems
5.	Contest Strategies and Optimization Time management techniques for competitive programming contests Understanding problem statements and devising efficient solutions Applying code optimization techniques for faster execution and reduced memory usage Debugging and handling common errors in competitive programming Participating in mock contests and real-time coding competitions

Note: This syllabus provides a broad outline for a competitive programming course. It is recommended to allocate sufficient time for each unit and incorporate regular practice sessions, coding exercises, and mock contests to enhance problem-solving skills and familiarity with the competitive programming environment.

Books :

"Competitive Programming 3" by Steven Halim and Felix Halim.
"Introduction to the Design and Analysis of Algorithms" by Anany Levitin
"Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles" by Narasimha Karumanchi
"Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
"Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology" by Dan Gusfield
"Computational Geometry: Algorithms and Applications" by Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars
"Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology" by Dan Gusfield
"Computational Geometry: Algorithms and Applications" by Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars
"Competitive Programmer's Handbook" by Antti Laaksonen
"Competitive Programming: The New Lower Bound of Programming Contests" by Hasan Jaddouh

Online Learning Platform:

Codeforces: https://codeforces.com/
Topcoder: https://www.topcoder.com/
HackerRank: https://www.hackerrank.com/
LeetCode: https://leetcode.com/
Codeforces: https://codeforces.com/
GeeksforGeeks: https://www.geeksforgeeks.org/
Brilliant: https://brilliant.org/
AtCoder: https://atcoder.jp/
Google Code Jam: https://codingcompetitions.withgoogle.com/codejam
"Algorithms, Part I" by Robert Sedgewick and Kevin Wayne (online course on Coursera)

VIII SEMESTER

Code:BCECCE8301	Major Project/Dissertation	10 Credits [LTP: 0-0-20]

A	Details

The students will undertake a project as part of their final semester. The students can do independent projects or can take up projects in groups of two or more depending on the complexity of the project. The maximum group size will be four and in case of team projects there should be a clear delineation of the responsibilities and work done by each project member. The projects must be approved by the mentor assigned to the student. The mentors will counsel the students for choosing the topic for the projects and together they will come up with the objectives and the process of the project. From there, the student takes over and works on the project.
If the student chooses to undertake an industry project, then the topic should be informed to the mentor, and the student should appear for intermediate valuations. Prior to undertaking this project the students undergo a bridge course.

Bridge Course:
The bridge course ensures that all the students have the correct prerequisite knowledge before their industry interface. The purpose of a bridge course is to prepare for a healthy interaction with industry and to meet their expectations. It would be difficult to establish standards without appropriate backgrounds and therefore to bridge this gap, students are put through a week mandatory classroom participation where faculty and other experts will give adequate inputs in application based subjects, IT and soft skills.

The Project:
Each student will be allotted a Faculty Guide and an Industry Guide during the internship/project work. Students need to maintain a Project Diary and update the project progress, work reports in the project diary. Every student must submit a detailed project report as per the provided template. In the case of team projects, a single copy of these items must be submitted but each team member will be required to submit an individual report detailing their own contribution to the project.
Each student/group should be allotted a supervisor and periodic internal review shall be conducted which is evaluated by panel of examiners.
Project Evaluation Guidelines:
The Project evaluator(s) verify and validate the information presented in the project report.
The break-up of marks would be as follows:

1. Internal Evaluation
2. External Assessment
3. Viva Voce

Internal Evaluation:
Internal Evaluator of project needs to evaluate Internal Project work based on the following criteria:

- Project Scope , Objectives and Deliverables
- Research Work, Understanding of concepts
- Output of Results and Proper Documentation
- Interim Reports and Presentations– Twice during the course of the project

External Evaluation:
The Project evaluator(s) perform the External Assessment based on the following criteria.

- Understanding of the Project Concept
- Delivery Skill
- The Final Project Report
- Originality and Novelty

The Final Project Report Details:

- The report should have an excel sheet that documents the work of every project member

Viva Voce

- Handling questions
- Clarity and Communication Skill

Marking Scheme:

1. **Internal Evaluation:** 35% of Total Marks
2. **External Evaluation:** 50% of Total Marks
3. **Viva Voce:** 15 % of Total Marks

For e.g., If the total mark for the project is 100, then

- Internal Evaluation = 35 marks

The break-up of marks is shown below:-

- Interim Evaluation 1: 10 marks
- Interim Evaluation 2: 10 marks
- Understanding of concepts: 5 marks
- Programming technique: 5 marks
- Execution of code : 5 marks
- External Evaluation = 50 marks

The break-up of marks is shown below:-

- Project Report: 15 marks
- Explanation of project working: 10 marks
- Execution of code: 10 marks – (if done in industry, a stand-alone module can be reprogrammed and submitted. Error rectification etc. can be included by the evaluator)
- Participation in coding: 15 marks
- Viva Voce = 15 marks

The break-up of marks is shown below: -

- Questions related to project: 10 marks
- Questions related to technology: 5 marks

The Project evaluator(s) verifies and validates the information presented in the project report

********** HAPPY LEARNING **********