POORNIMA UNIVERSITY

SCHOOL OF COMPUTER SCIENCE & ENGINEERING

BACHELOR OF COMPUTER APPLICATIONS

(CLOUD TECHNOLOGY)

TEACHING SCHEME & SYLLABUS

(Batch 2023-26)

INDEX

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:

Your Dreams Our Goal

POORNIMA UNIVERSITY

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

VISION

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

Mission

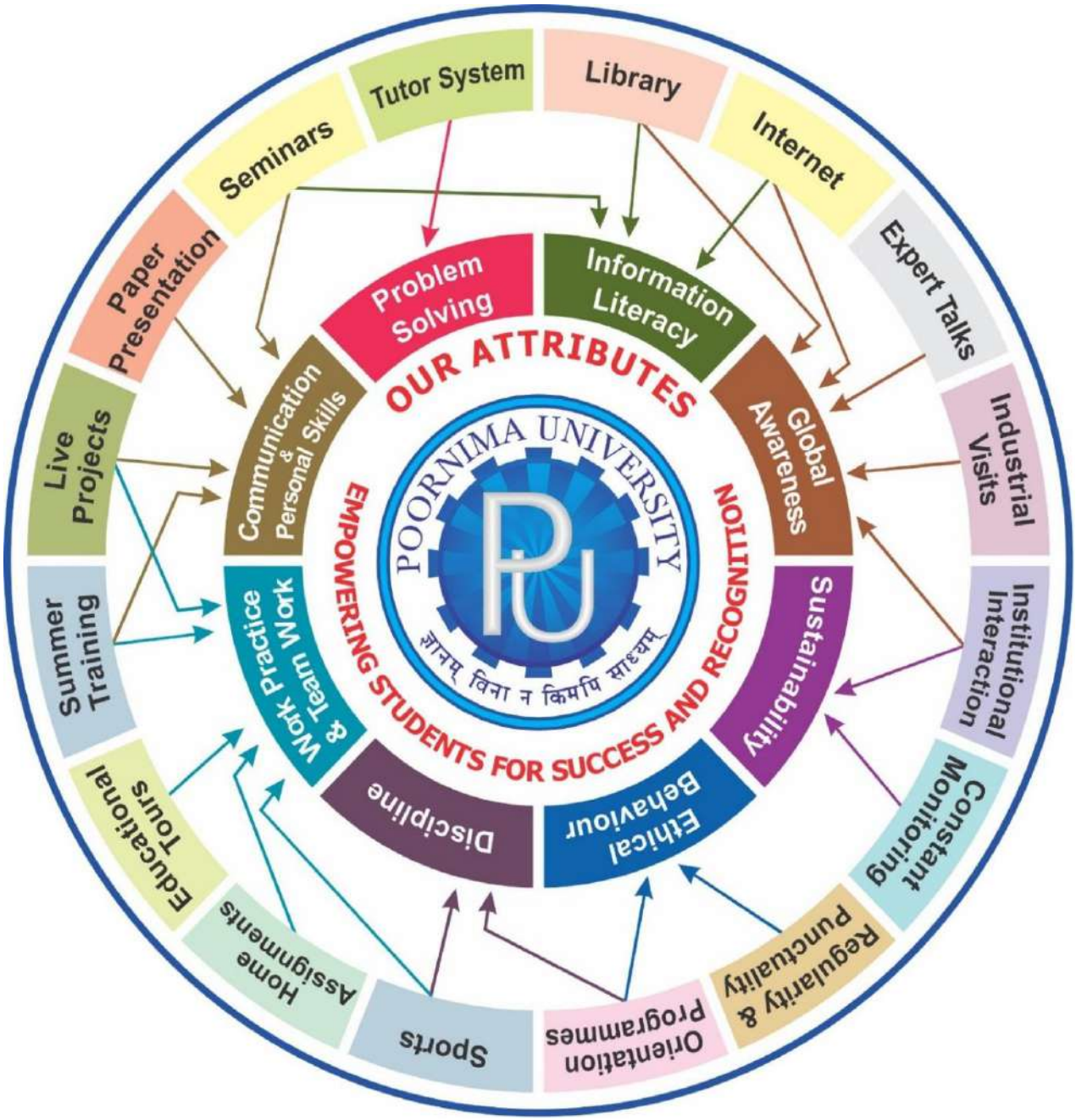
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

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 Computer Applications (BCA)

Nature of the Programme: BCA is a three year full-time programme.

Program Outcomes (PO) :

Graduates will be able to:

PO1: Computational information: Appreciate and apply mathematical organization, computing and domain information for the conceptualization of computing models from clear harms.

PO2: Difficulty Analysis: Talent to classify, significantly evaluate and prepare complex computing problems using fundamentals of computer knowledge and request domains.

PO3: Drawing / Improvement of Solutions: Facility to transform composite production scenarios and present-day issues into problems, explore, recognize and propose included solutions using rising technologies.

PO4: Accomplish Investigations of Compound Computing Troubles: Ability to invent and ways experiments interpret data and present well up to date conclusions.

PO5: Current Implement Procedure: Skill to select recent computing tools, skills and techniques compulsory for original software solutions

PO6: Proficient Principles: Facility to apply and give expert principles and cyber systems in a universal monetary situation.

PO7: Ultimate Education: Identify the need for and enlarge the ability to appoint in permanent education asa Computing qualified.

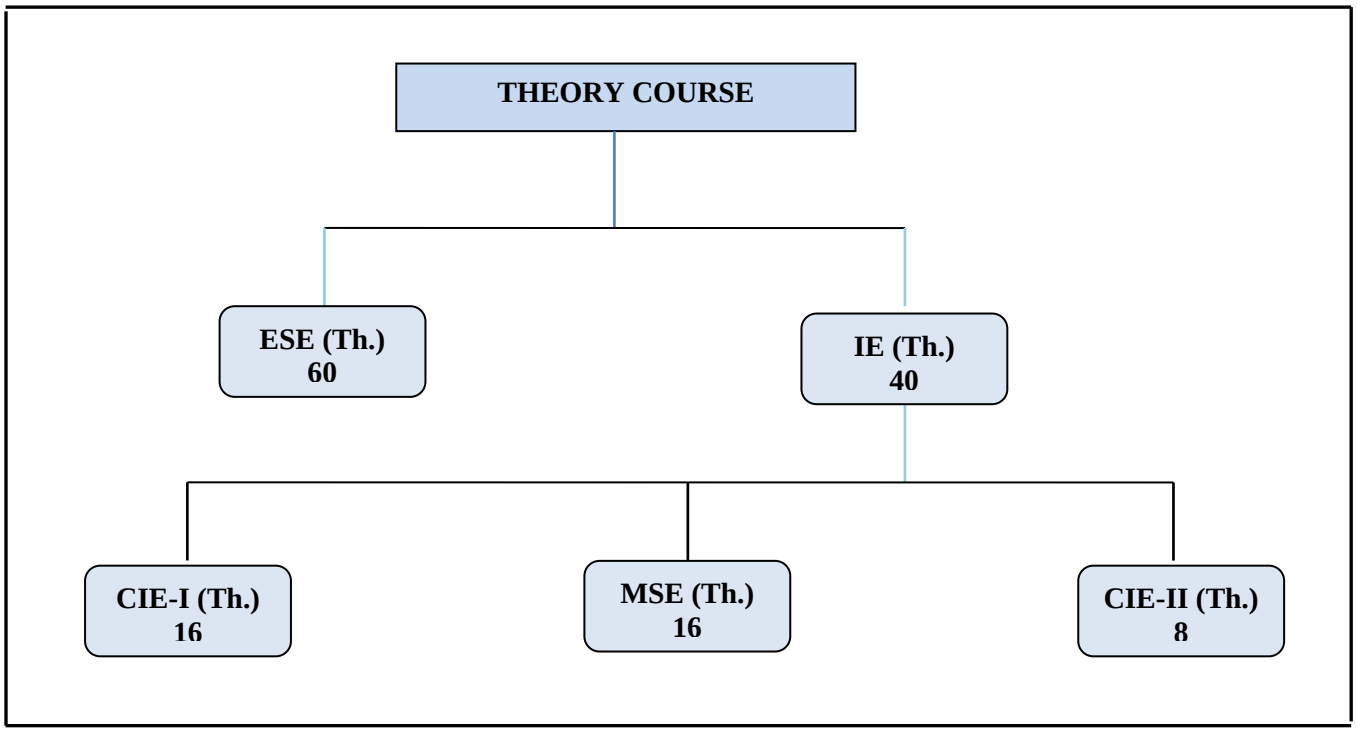
PO8: Individual and team work: Ability to job as a part or manager in various teams in multidisciplinary situations.

PO9: Communication: being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

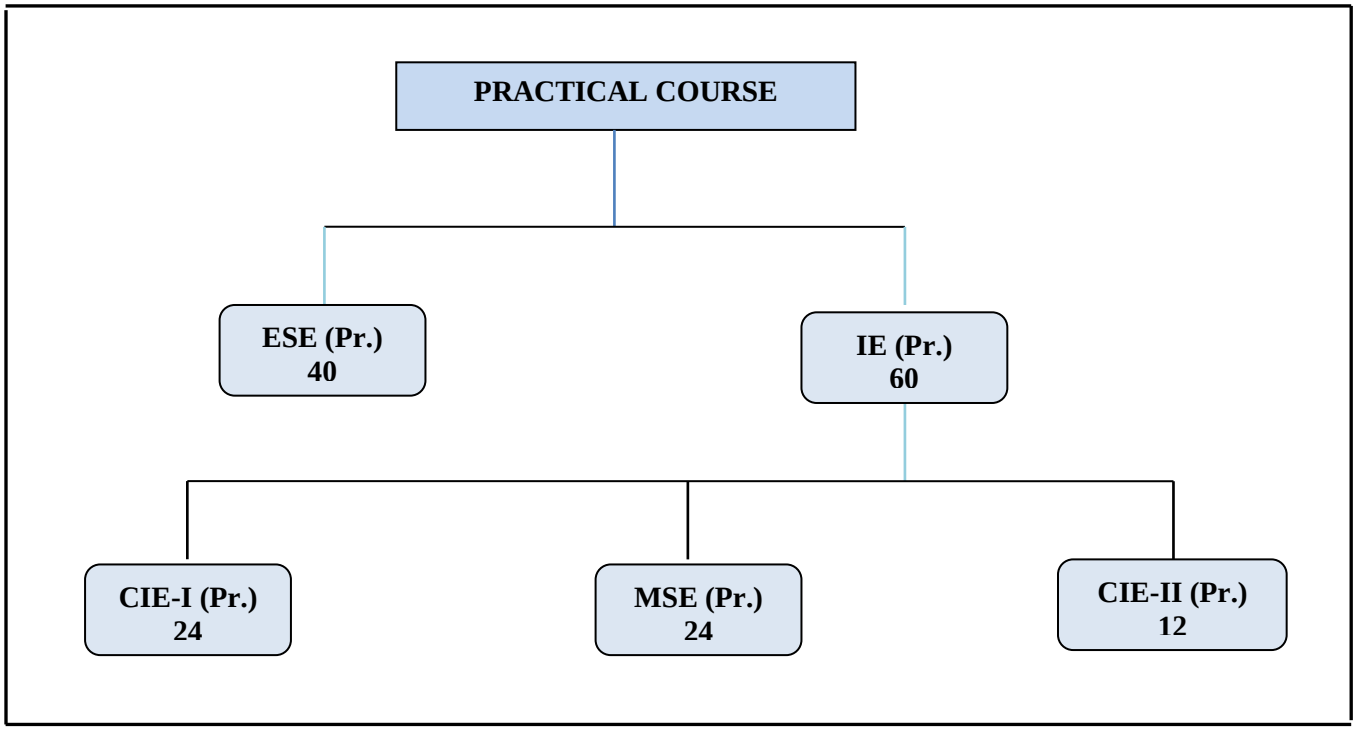
PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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 % of Marks in the Program = *CGPA* *10

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 :BCA with Minor in Artificial Intelligence and Data Science Duration: 3 years Total Credits: 131

Teaching Scheme for Batch 2023-26

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**								
BCACCA1101	Programming Fundamentals of C	**3**	**-**	**-**	**1+ 1***	**40**	**60**	**100**	**3**
BCACCA1102	Operating System	**3**	**-**	**-**	**1***	**40**	**60**	**100**	**3**
BCACCA1103	Computer Fundamental and Office Automation	**3**	**-**	**-**	**1***	**40**	**60**	**100**	**3**
BCACCA1104	Introduction to Web Technology	**3**	**-**	**-**	**2***	**40**	**60**	**100**	**3**
A.2	**Practical**								
BCACCA1201	Programming Fundamentals of C Lab	**-**	**-**	**2**		**60**	**40**	**100**	**1**
BCACCA1202	Operating System Lab	**-**	**-**	**2**		**60**	**40**	**100**	**1**
BCACCA1203	Office Automation Lab	**-**	**-**	**2**		**60**	**40**	**100**	**1**
BCACCA1204	Web Technology Lab			**2**		**60**	**40**	**100**	**1**
B.	**Minor Stream Courses/Department Elective**								
B.1	**Theory**								
BCTCCA1101	Fundamentals of Cloud Technology	**3**			**1***	**40**	**60**	**100**	**3**
B.2	**Practical**								
	-	-	-	-		-	-	-	
C	**Multidisciplinary Courses**								
	-	**-**	-	-		-	-	-	**-**
D	**Ability Enhancement Courses (AEC)**								
BULCHU1202	Foundation English	**-**	**-**	**2**		**60**	**40**	**100**	**1**
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		**17**	**-**	**12**	**1+6***				
Total Teaching Hours		**30/36**							**23**

SH: Supporting Hours

- Classes will be conducted fortnightly.

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program : BCA with Minor in Artificial Intelligence and Data Science Duration: 3 years Total Credits: 131

Teaching Scheme for Batch 2023-26

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**								
BCACSA2101	Basic of Mathematics	**3**			**1***	**40**	**60**	**100**	**3**
BCACCA2102	Computer Networks	**3**			**1***	**40**	**60**	**100**	**3**
BCACCA2103	Python Programming	**3**			**1***	**40**	**60**	**100**	**3**
BCACCA2104	Linux and Shell Script	**3**			**1***	**40**	**60**	**100**	**3**
BCACCA2105	Software Engineering	**3**			**1***	**40**	**60**	**100**	**3**
A.2	**Practical**								
BCACCA2201	Computer Networks Lab			**2**		**60**	**40**	**100**	**1**
BCACCA2202	Python Programming Lab			**2**		**60**	**40**	**100**	**1**
BCACCA2203	Linux and Shell Script Lab			**2**		**60**	**40**	**100**	**1**
BCACCA2204	**Software Enginee**ring Lab			**2**		**60**	**40**	**100**	**1**
B.	**Minor Stream Courses**								
B.1	**Theory**								
B.2	**Practical**								
C	**Multidisciplinary Courses**								
BCAEMC2121	MOOC Course-I	1	-	-	1*	**40**	**60**	**100**	**1**
D	**Ability Enhancement Courses (AEC)**								
BULCHU2204	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)**								
BUVCSA2102	Environment & Sustainability	**2**	**-**	**-**		**40**	**60**	**100**	**2**
G	**Summer Internship / Research Project / Dissertation**								
	-	-	-	-		-	-	-	-
Total		**18**	-	**12**	**6***				
Total Teaching Hours		**30/36**							**24**

SH: Supporting Hours

- Classes will be conducted fortnightly.

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program :BCA with Minor in Artificial Intelligence and Data Science **Duration: 3 years** **Total Credits: 131**

Teaching Scheme for Batch 2023-26

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**								
BCACCA3101	Relational Database Management System	**3**			**1***	**40**	**60**	**100**	**3**
BCACCA3102	OOPS with Java	**3**			**1***	**40**	**60**	**100**	**3**
BCACCA3103	Data Structure and Algorithm	**3**	-	-	**1***	**40**	**60**	**100**	**3**
BCACCA3104	Computer Organization and Architecture	**3**	-	-	**1***	**40**	**60**	**100**	**3**
A.2	**Practical**								
BCACCA3201	Relational Database Management System Lab	-	-	**2**		**60**	**40**	**100**	**1**
BCACCA3202	OOPS with Java Lab	-	-	**2**		**60**	**40**	**100**	**1**
BCACCA3203	Data Structure and Algorithm Lab	-	-	**2**		**60**	**40**	**100**	**1**
B.	**Minor Stream Courses**								
B.1	**Theory**								
BCTCCA3101	Principles of Virtualization	3	-	-	**1***	**40**	**60**	**100**	**3**
B.2	**Practical**								
BCTCCA3201	Principles of Virtualization Lab	-	-	**2**		**60**	**40**	**100**	**1**
C	**Multidisciplinary Courses**								
BCAEMC3121	MOOC Course-II	**1**	_	_	1*				**1**
D	**Ability Enhancement Courses (AEC)**								
BULCHU3208	Communication Skills-I	**-**	**-**	**2**		**60**	**40**	**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**	-	-		**60**	**40**	**100**	**2**
G	**Summer Internship / Research Project / Dissertation**								
	NIL	-	-	-		-	-	-	-
Total		**18**	-	**12**	6*				
Total Teaching Hours		**30/36**							**24**

SH: Supporting Hours

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POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

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Teaching Scheme for Batch 2023-26

Semester-IV

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**								
BCACCA4101	Big Data Analysis	**3**	-	-	**1***	**40**	**60**	**100**	**3**
BCACCA4102	Design and Analysis of Algorithm	**3**	-	-	**1***	**40**	**60**	**100**	**3**
A.2	**Practical**								
BCACCA4201	Big Data Analysis Lab	-	-	**2**		**60**	**40**	**100**	**1**
BCACCA4202	Design and Analysis of Algorithm Lab	-	-	**2**		**60**	**40**	**100**	**1**
B.	**Minor Stream Courses**								
B.1	**Theory**								
BCTCCA4101	Cloud Web Services	**3**	-	-	**1***	**40**	**60**	**100**	**3**
BCTCCA4102	Network Administration	**3**	-	-	**1+1***	**40**	**60**	**100**	**3**
B.2	**Practical**			-					
BCTCCA4201	Cloud Web Services Lab	-	-	**2**		**60**	**40**	**100**	**1**
BCTCCA4202	Network Administration Lab	-	-	**2**		**60**	**40**	**100**	**1**
C	**Multidisciplinary Courses**								
BCAEMC4121	MOOC Course-III	**1**	-	-	1*	-	-		**1**
D	**Ability Enhancement Courses (AEC)**								
BULCHU4109	Negotiation skills & Persuasive Communication	**2**	-	-		**40**	**60**	**100**	**2**
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**								
BCACCA4401	Industrial Training Seminar-1	-	-	**2**	**1***	**60**	**40**	**100**	**1**
Total		**17**	-	**12**	**1+6***	-	-	-	
Total Teaching Hours		**30/ 36**							**23**

SH: Supporting Hours

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POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program : BCA with Minor in Artificial Intelligence and Data Science Duration: 3 years Total Credits: 131

Teaching Scheme for Batch 2023-26

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**								
BCACCA5101	Advanced Data Structure	**3**	-	-	**1***	**40**	**60**	**100**	**3**
A.2	**Practical**								
B.	**Minor Stream Courses**								
B.1	**Theory**								
BCTCCA5101	Cloud Deployment	**3**		-	**1***	**40**	**60**	**100**	**3**
BCTCCA5102	Cloud Container	**3**		-	**1***	**40**	**60**	**100**	**3**
BCTCCA5103	Cryptography and Cloud Security	**3**		-		**40**	**60**	**100**	**3**
BCTCCA5104	Advanced Cloud Technology	**3**		-	**1***	**40**	**60**	**100**	**3**
B.2	**Practical**								
BCTCCA5201	Cloud Deployment Lab	-	-	**2**		**60**	**40**	**100**	**1**
BCTCCA5202	Cloud Container Lab	-	-	**2**		**60**	**40**	**100**	**1**
BCTCCA5203	Cryptography and Cloud Security Lab	-	-	**2**		**60**	**40**	**100**	**1**
C	**Multidisciplinary Courses**								
BCAEMC5121	MOOC Course-IV	**1**	-	-	1*	60	40	100	**1**
D	**Ability Enhancement Courses (AEC)**								
BULCHU5115	Entrepreneurial & Managerial Skills	**2**	-	-		**60**	**40**	**100**	**2**
E	**Skill Enhancement Courses (SEC)**								
BULCSE5201	Skill Enhancement Generic Course –V	-	-	**2**		**60**	**40**	**100**	**1**
F	**Value Added Courses (VAC)**								
BUVCCE5102	Internet of Things	**2**	-	-		**60**	**40**	**100**	**2**
G	**Summer Internship / Research Project / Dissertation**								
BCACCA5401	Industrial Training Seminar-II			**2**	**1***	**60**	**40**	**100**	**1**
Total		**20**	-	**10**	**6***				
Total Teaching Hours		**30/36**							**25**

SH: Supporting Hours

- Classes will be conducted fortnightly.

POORNIMA UNIVERSITY, JAIPUR

Faculty of Computer Science and Engineering

Name of Program : BCA with Minor in Artificial Intelligence and Data Science Duration: 3 years Total Credits: 131

Teaching Scheme for Batch 2023-26

Semester-VI

Course Code	Name of Course	Teaching Scheme			Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)	IE	ESE	Total	
A.	**Major (Core Courses)**							
A.1	**Theory**							
BCACCA6101	IPR and Patent	**3**	-	-	**40**	**60**	**100**	**3**
A.2	**Practical**							
B.	**Minor Stream Courses**							
B.1	**Theory**							
BCTCCA6101	Cloud migration and Data Center	**3**	**-**	**-**	**40**	**60**	**100**	**3**
B.2	**Practical**							
BCTCCA6201	Cloud migration and Data Center Lab	**-**	**-**	**2**	**60**	**40**	**100**	**1**
C	**Multidisciplinary Courses**							
D	**Ability Enhancement Courses (AEC)**							
BULCHU6120	Presentation and Interview Skills	2	-	-	**40**	**60**	**100**	**2**
E	**Skill Enhancement Courses (SEC)**							
BULCSE6201	Skill Enhancement Generic Course –VI	-	-	**2**	**60**	**40**	**100**	**1**
F	**Value Added Courses (VAC)**							
	NIL							
G	**Summer Internship / Research Project / Dissertation**							
BCACCA6501	Project/Internship	**-**	**-**	**4**	**60**	**40**	**100**	**2**
Total		**8**	-	**8**				
Total Teaching Hours		**16**						**12**

SH: Supporting Hours

- Classes will be conducted fortnightly.

Major (Core Courses)
Theory

Code: BCACCA1101	Programming Fundamentals of C	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

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, do-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 and dynamic array • Scope rules- Local & global variables. • Functions-parameter passing, call by value and call by reference, calling functions with arrays, command line argument, recursion- basic concepts. • 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, function retuning pointers. • Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to • functions, structure pointers, arrays and structures within structures, typedef. • Unions – Declaration, uses • Enumerated data-types • 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, Conditional compilation directives. • C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions. • Conclusion of the Unit

A. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Let us C, 6th Edition	Yashwant Kanitkar	6th Edition	PBP Publication
2.	The C programming Language	Richie and Kenninghan	2004	BPB Publication,
3.	Programming in ANSI C 3rdEdition, 2005	E.Balagurusamy	3 Edition, 2005	Programming in ANSI C
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 CO VS PO/PSO

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

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

Code: BCACCA1102	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. 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**

B. 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, Monoprogramming 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

A. RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1	Operating system concepts	Silberschatz, Galvin, Gagne	$_{8}$th edition	John Wiley and Sons
2	Modern Operating System	A.S.Tanenbaum	2nd Edition	Pearson
Reference Books				
1.	Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.			
Online Resources				
1.	https://www.coursera.org/courses?query=operating%20system			
2.	https://hackr.io › tutorials › learn-operating-systems			

MAPPING OF CO VS PO/PSO

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

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

Code: BCACCA1103 Computer Fundamental and Office Automation 3 Credit [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

CO1: Understand the basics of computer systems and its components.
CO2: Possess the knowledge of operating systems.
CO3: Understand and apply the basic concepts of a word processing package.
CO4: Understand and apply the basic concepts of electronic spreadsheet software.
CO5: Understand and create a presentation using PowerPoint tool.

A. **OUTLINE OF THE COURSE**

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Fundamentals of computer	08
2.	Operating system (Windows XP)	06
3.	Word Processing	08
4.	Excel Spreadsheet	08
5.	PowerPoint Presentations	06

A. DETAILED SYLLABUS

Unit	Unit Details
1.	**Fundamentals of computer**
	• Introduction to Fundamentals of computer • Overview Of a Computer • Functional Components of a computer (Working of each unit) • Evolution Of Computers, Generations Of Computers, Classification Of Computers, Applications Of Computers • Hardware: Block diagram of computer, Input and Output devices, Memory and storages devices, Different ports and its uses, Different type of printers • Conclusion of unit
2.	**Operating system (Windows XP)**
	• Introduction to Operating system (Windows XP) • Windows concepts, Features • Windows Structure, Desktop, Task bar, Start Menu, My Computer, Recycle Bin • Windows Accessories, calculator, Notepad, Paint, Word pad, Character Map • Windows Explorer, Entertainment, • Installation of Hardware and Software • Using scanner, system tools, communication, sharing information between computers • Conclusion of unit
3.	**Word Processing**
	• Introduction to Word Processing • Typing, Editing, Proofing & Reviewing • Formatting Text & Paragraphs • Automatic Formatting and Styles • Working with Tables, Graphics and Frames • Mail Merge • Automating Your Work • printing Documents • Conclusion of unit
4.	**Excel Spreadsheet**
	• Introduction to Excel Spreadsheet • Working & Editing In Workbooks • Creating Formats & Links • Formatting a Worksheet & creating graphic objects • Creating Charts (Graphs) • Formatting and analyzing data • Organizing Data in a List (Data Management)

	• Sharing & Importing Data, Printing. • Conclusion of unit
5.	**Power Point Presentations**
	• Introduction to PowerPoint Presentations • Getting started in PowerPoint • Creating a presentation, Creating & editing slides • Previewing a slide show • Adding picture & graph • Adding sound & video • Adding auto shape • Animating objects. • Conclusion of unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Digital Logic and Computer Design	M.M. Mano	Thirteenth Impression	Pearson Education
2.	Fundamentals of Computers	V. Rajaraman	3rd Edition	PHI New Delhi
Reference Book				
1.	Microsoft Office 2003: The Complete Reference, McGraw-Hill Inc.			
2.	T.C. Bartee, 1991, Computer Architecture and Logical Design, McGraw Hill.			
3.	Microsoft Office 2000- Training Guide, Maria Reid-Karl Schwartz, Diana Rain, BPB Publications			
Online Resources				
1.	https://www.tutorialspoint.com/computer_fundamentals/index.htm			
2.	https://onlinecourses.swayam2.ac.in/cec19_cs06/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	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2		2		2	-	-	-	-	-	-	-	-	-	-

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

Code: BCACCA1104	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.
- Plan and conduct user research related to web usability.
- Apply HTML & CSS to solve real time web problems.

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 color, 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, Geolocation, Microdata, 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 website 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	Apress2017
3	HTML & CSS:The Complete Reference	Thomas Powell	2010 Fifth Edition	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			

MAPPING OF CO VS PO/PSO

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

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

PRACTICAL

Code: BCACCA1201	Programming Fundamentals of C Lab	1 Credit [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 2004	PBP Publication,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 byE.Balagurusamy, Tata McGraw Hill			
Online Resources				
1.	https://www.programiz.com/c-programming/examples			
2.	https://www.w3resource.com/c-programming-exercises			

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	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	3	2	-	-	-	-	-	-	-	-	-	-

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

Code: BCACCA1202	Operating System Lab	1 Credit [LTP: 0-0-2]

Course Outcome: -

Students will be able to:

- Implement basic Scheduling algorithms and memory allocation techniques.
- Implement memory management techniques like MVT and MFT
- Implement memory allocation algorithms.
- Detect deadlocks and avoid them.
- Implement different page replacement algorithms

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	2nd Edition	Pearson
Reference Book				
1.	Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.			
Online Resources				

MAPPING OF CO VS PO/PSO

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

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

Code: BCACCA1203	Office Automation Lab	1 Credit [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: • Three Column and Four Column setting • Set One or Two Advertisements • Use Bullets and Numbering.
3	**Create a Document consisting of Bio-data. It includes** • A table giving your qualification and /or experience of work. Table should be Bordered and Shaded. • 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. • 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. • 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. • Select cell B4:D4 and change the horizontal alignment to center and text to 90degree. • All titles should be in bold • Format all cells numbers to currency style and adjust width as necessary. • 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 • Use filter to display the details of employees whose salary is greater than 10,000. • Sort the employees on the basis of their net pay • 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: • 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. • 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 • 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.

MAPPING OF CO VS PO/PSO

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

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

Code: BCACCA1204	Web Technology Lab	1 Credit [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: i. Control the repetition of image with back ground-repeat property. ii. Define style for links asa: link, b:active,c:hover,d:visited. iii. Add customized cursors for links.
3	**Profile Page Create a My** 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: i. Use different font styles. ii. 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.

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	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

MAPPING OF CO VS PO/PSO

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

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

Minor Courses
Theory

Code: BCTCCA1101 Fundamentals of Cloud Technology 3 Credit [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Be familiar with the fundamentals and essentials of Cloud Computing.
- To know a sound foundation of the Cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To manage the student different platform and Services of Cloud
- Explore some important cloud computing driven commercial systems such as GoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.
- To able to handle the daily and commercial life use of Cloud and capable to apply in it

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Fundamentals of Cloud Computing**	07
2.	**Cloud Models**	08
3.	**Cloud Platforms**	08
4.	**Cloud Computing - Challenges, Risk and Mitigation**	07
5.	**Managing the Cloud**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Fundamentals of Cloud Computing**
	• Introduction of Unit • Cloud Computing Basics – History of Cloud Computing, Characteristics of Cloud Computing, Need for Cloud computing, Advantages and Possible Disadvantages of cloud computing , • Cloud Deployment Models- Public, Private, Hybrid Community, Other deployment Models. • Evolving Data Center into Private Cloud, Datacenter Components • Extracting Business value in Cloud Computing – Cloud Security, Cloud Scalability, Distribution over the Internet, • Conclusion of Unit
2.	**Cloud Models**
	• Introduction of Unit • Introduction to Cloud Services, Infrastructure as a Service (IaaS) – Overview, Virtualization,Container, Pricing Models • Service Level Agreements, Migrating to the Cloud, IaaS Networking options, Virtual Private Cloud(VPC), IaaS Storage – File and Object storage • Data Protection, IaaS security, Benefits, Risks and Examples of IaaS. Platform as a Service (PaaS) – Overview, IaaS vs PaaS, PaaS Examples, benefits and risks. Software as a Service (SaaS) – Introducing SaaS: SaaS Examples – Office 365, Google G Suite, Salesforce.com • Evaluating SaaS – user and vendor perspective, Impact of SaaS, Benefits and risks of SaaS. Other Services on Cloud, Cloud Delivery Models Considerations • Conclusion of Unit
3.	**Cloud Platforms**

	• Introduction of Unit • Introducing Cloud Platforms, Evaluating cloud platforms, Cloud Platform technologies-Amazon Web Services, Microsoft Azure, Google Cloud Platform, Salesforce.com • Impact of Cloud platforms. Private Cloud Platforms – Introducing Private clouds – Microsoft Azure
	stack, Open stack, AWS Greengrass, Impact of Private clouds • Cloud Migration : 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, • Conclusion of Unit
4.	**Cloud Computing - Challenges, Risk and Mitigation**
	• Introduction of Unit • Cloud Storage, Application performance, Data Integration, Security. Ensuring Successful Cloud Adoption: Designing a Cloud Proof of Concept, Vendor roles and capabilities, moving to the Cloud. Impact of Cloud on IT Service Management. • Risks and Consequences of Cloud Computing – Legal Issues, Compliance Issues, Privacy and Security. • Conclusion of Unit
5.	**Managing the Cloud**
	• Introduction of Unit • Managing and Securing Cloud Services, Virtualization and the Cloud, Managing Desktops and devices on the cloud, SOA and Cloud computing, Managing the Cloud environment, • Planning for the Cloud – Economic Cost Model and Leveraging the Cloud, Cloud computing resources, Cloud Dos and Don'ts. • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Cloud computing a practical approach -	Anthony T.Velte , Toby J. Velte Robert Elsenpeter,	Latest	TMH.
2.	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online -	Michael Miller	2008	Que 2008
Reference Book				
1	Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010			
2	Professional Mobile Application Development Jeff McWherter, Scott Pearson Education, 2012			
Online Resources				
1.	https://www.edx.org/learn/cloud_computing			

MAPPING OF CO VS PO/PSO

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

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

Ability Enhancement Courses (AEC)

CODE: BULCHU1202	Foundation English	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES

Students would be able to:

CO1: Demonstrate the grammar skills involved in writing sentences and short paragraphs.

CO2: Build up a good command over English grammar and vocabulary to be able to ace error spotting.

CO3: Define unknown words in sentence level context using a picture dictionary or by creating a memory link for support.

CO4: Understand, analyze and effectively use the conventions of the English language.

CO5: Develop their interest in reading and enhance their oral and silent reading skills along with sharpen their critical and analytical thinking

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Basics of Grammar**	**8**
2	**Spotting the Grammatical Errors and Rectification**	**2**
3	**Vocabulary Building**	**4**
4	**Basics of Writing Skills**	**2**
5	**Reading Comprehension**	**8**

B. LIST OF EXPERIMENTS

1	Parts of Speech: Theory & Practice through various Exercises
2	Sentence Structures: Theory & Practice through various Exercises
3	Tenses: Theory & Practice through various Exercises
4	Spotting the Errors: Applying the rules and Practice Questions
5	Vocabulary Building-I: Practice by sentence formation
6	Vocabulary Building-II: Practice by sentence formation
7	Paragraph Writing
8	Article Writing
9	Précis Writing
10	Formal & Informal Letter Writing
11	Reading Comprehension- I: Beginner's level reading and Answering the Questions (Competitive Exams)
12	Reading Comprehension- II: Intermediate's level reading and Answering the Questions (Competitive Exams)

Skill Enhancement Courses (SEC)

CODE: BULCSE1201	Skill Enhancement Generic Course -I	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

Students will be able to:

CO.1: Enhance problem solving skills.
CO.2: Prepare for various public and private sector exams & placement drives
CO.3: Communicate effectively & appropriately in real life situation.
CO.4: Improve verbal ability skill among students.
CO.5: Enrich their knowledge and to develop their logical reasoning thinking ability.

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

Value Added Courses (VAC)

CODE: BUVCSA1102	Environment Studies	2 Credit [LTP: 2-0-0]

COURSE OUTCOMES:

Students would be able to:

CO1: Understand the scope of environmental studies and explain the concept of ecology, ecosystemand biodiversity.
CO2: Implement innovative ideas of controlling different categories of Environmental Pollution. CO3: Explain different environmental issues together with various EnvironmentalActs, regulations and 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 noisepollution • 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.RECOMMENDED STUDY MATERIAL:

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

Semester-II

Code: BCACSA2101	Basic Mathematics	3Credits [LTP: 3-0-0]

COURSE OUTCOME **(Basic of Mathematics)**

Students will be able to:

- To analyze and prove relationships between matrices, rank of matrix and systems of equations, Inverses.
- Analyze the correlation and regression with their properties
- Determine the basic concepts of matrix Algebra
- Analyze the equal and unequal intervals for Interpolation problem
- Analyze the numerical methods to solve differential equations

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Data representation and Analysis**	08
2.	**Regression and Correlation**	08
3.	**Matrices**	08
4.	**Interpolation Methods**	08
5.	**Numerical integration and differentiation**	08

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Data representation and Analysis**
	• Introduction of Unit • Statistical diagram: scattered diagram, histogram, ogiecurve, pilchard • Measure of Central Tendency, Mean, Median, Mode. • Measure of Dispersion : Range, Quartile Deviation • Standard Deviation • Conclusion & Real Life Application
2.	**Regression and Correlation**
	• Introduction of Unit • Measure of association between two variables Types of correlation , Karl Pearson‘s Coefficient of correlation • Spearman‘s Rank correlation and its interpretations • Regression Analysis: Concept and difference between correlation and regression, linear regression equations, • Properties of regression coefficients • Conclusion & Real Life Application
3.	**Matrices**
	• Introduction of Unit • Definition of Matrix • Types of Matrices • Arithmetic operations of Matrices (Addition, Scalar Multiplication, Matrix Multiplication) • Determinants • Computation of Inverse • Conclusion of Unit
4.	**Interpolation Methods**
	• Introduction of Unit • Finite difference, Forward and backward differences, Interpolation and Extrapolation, • Newton‘s forward interpolation formula, Newton‘s back ward interpolation formula, • Lagrange‘s interpolation formula • Newton‘s divided difference formula • Conclusion & Real Life Application
5.	**Numerical Integration and differentiation**

	• Introduction of Unit • Numerical integration, Gaussian integration Trapezoidal Method, Simpson's rule (1/3,3/8), • Numerical differentiation Euler's method, Modified Euler's method, Runge Kutta 4th order method,. • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL

S.No	Text Books:	Author	Edition	Publication
1.	Business Mathematics	V.K. Kapoor	Latest	S. Chand and Sons Publications
2.	Introductory Methods of Numerical Analysis	S.S. Sastry	Latest	Prentice Hall of India
3.	Computer Oriented Numerical Methods	V. Rajaraman	Latest	Prentice Hall of India
Reference Book				
1.	HigherEngineeringMathematics,GrewalB.S.andGrewalJ.S,KhannaPublishers,NewDelhi, Latest Edition			
2.	A textbook of Computer based numerical and Statistical Techniques: A.K. Jaiswal & Anju Khandelwal, New Age International Publishers			
OnlineResources				
1.	https://www.udemy.com/course/computer-oriented-numerical-techniques/			
2.	https://onlinecourses.swayam2.ac.in/cec22_ma02/preview			

MAPPING OF CO VS PO/PSO

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

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

Code: BCACCA2102	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).
- Acquire 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
- Know the concepts of reliable data transfer and how TCP implements these concepts.
- Learn the principles of WAN routing and the semantics.

A. 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

B. 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 V/S. 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 (Fiber 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 sub-neting, 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

C. 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				
1.	Networking All in One – Doug Lowe 7th edition Publisher- Wiley			
Online Resources				
1.	https://www.edx.org/learn/computer-networking			
2.	https://www.youtube.com/watch?v=VwN91x5i25g			

MAPPING OF CO VS PO/PSO

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

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

Code:BCACCA2103	Python Programming	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Acquire 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) • loop manipulation using continue, pass, break, else. • .Conclusion of Unit
3.	**Data Structures, Python Functions and Packages**
	• Introduction to Unit • Lists, Tuple, Sets, Dictionaries • String and Slicing • Use of Python builtUser defined functions and its types • Command-line Arguments • Python Packages: Introduction, Writing Python packages • Using standard packages (e.g. math, scipy, Numpy, matplotlib, pandas etc.) • user defined packages • Conclusion of Unit
4.	**Object Oriented Programming**

	• Introduction of Unit • Creating Classes and Objects • Inheritance • Method Overloading and Overriding • Data Hiding • Data abstraction, Abstract classes • Types of Methods : Instance Methods , Static Methods , Class Methods • Accessing attributes , Built-In Class Attributes • Destroying Objects • Conclusion of Unit
5.	**File I/O Handling and Exception 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 • Moving cursor in file inbuilt -functions • Errors in Python : Compile-Time Errors ,Runtime Errors , Logical Errors • What is Exception? • 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	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 CO VS PO/PSO

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

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

Code:BCACCA2104	Linux and Shell Script	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator.
- Write Shell Programming using Linux commands.
- Design and write application to manipulate internal kernel level Linux File System.
- Develop IPC-API's that can be used to control various processes for synchronization.
- Develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Linux and Linux utilities**	07
2.	**Introduction to shells**	08
3.	**Unix file structure**	08
4.	**Process and signals**	07
5.	**Inter process communication**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Linux and Linux utilities**
	• Introduction of Unit • INTRODUCTION TO LINUX AND LINUX UTILITIES: A brief history of LINUX, architecture of LINUX, • features of LINUX, introduction to vi editor. • Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, • rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, • process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, • ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , • sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio • Conclusion of Unit
2.	**Introduction to shells**
	• Introduction of Unit • Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, • Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, • Variables, Predefined Variables, Options, Shell/Environment Customization. • Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, • Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, • Comparing Files. • Conclusion of Unit
3.	**Unix file structure**
	• Introduction of Unit • Grep: Operation, grep Family, Searching for File Content. • Sed :Scripts, Operation, Addresses, commands, Applications, grep and sed. • UNIX FILE STRUCTURE: Introduction to UNIX file system, inode (Index Node), file descriptors, • system calls and device drivers. • Conclusion of Unit
4.	**Process and signals**

	• Introduction of Unit • PROCESS AND SIGNALS: Process, process identifiers, process structure: process table, viewing • processes, system processes, process scheduling, starting new processes: waiting for a process, • zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable • signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. • File locking: creating lock files, locking regions, use of read and write with locking, competing locks,other lock commands, deadlocks. • Conclusion of Unit
5.	**Inter process communication**
	• Introduction of Unit • INTER PROCESS COMMUNICATION: Pipe, process pipes, the pipe call, parent and child • processes, and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, • msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands. • INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses, • socket, connect, bind, listen, accept, socket communications. • Awk and perl Programming: Awk pattern scanning and processing language, BEGIN and END patterns, Awk arithmetic and variables, Awk built in variable names and operators, arrays, strings, • functions, perl; the chop() function, variable and operators, $_ and $. , Lists, arrays, regular expression and substitution, file handling, subroutines, formatted printing. • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	*Advanced Programming in the UNIX Environment*	*W. Richard. Stevens*	3rd edition	Pearson Education
2.	Unix and shell Programming	*Stephen Kochan, Patrick Wood*	Latest	Sams
Reference Book				
1.	Linux System Programming, *Robert Love, O'Reilly*, SPD.			
2.	Advanced Programming in the UNIX environment, 2nd Edition, *W.R.Stevens*, Pearson Education.			
3.	UNIX Network Programming, *W.R. Stevens*, PHI. UNIX for Programmers and Users, 3rd Edition, *Graham Glass, King Ables*, Pearson Education			
Online Resources				
1.	https://www.tutorialspoint.com/unix/shell_scripting.htm			
2.	https://www.javatpoint.com/shell-scripting-tutorial			

MAPPING OF CO VS PO/PSO

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

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

Code: BCACCA2105	Software Engineering	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Gather and specify requirements of the software projects.
- Analyze software requirements with existing tools.
- Differentiate different testing methodologies.
- Apply the basic project management practices in real life projects.
- Work in a team as well as independently on software projects

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1	**Software Process Models**	8
2	**Software Design**	8
3	**Introduction to Software Testing**	10
4	**Software Quality Management**	8
5	**Software Project Management**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Software Process Models**
	• Introduction to Unit • How to develop software? • Different models - Water fall model – Prototyping – evolutionary model- Spiral model– RAD model - Agile models: Extreme Programming, and Scrum-pros and cons of each model • Requirements Analysis-Functional and Non-functional requirements, • Software Requirement Specification(SRS)–Decision tables–DecisionTrees • Conclusion of the Unit
2.	**Software Design**
	• Introduction to Unit • Overview of design process: High-level and detailed design • Cohesion and Coupling Design Methodologies • Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure • Architectural Design, Interface design, Component Leve ldesign • Software Reuse and Software Maintenance issues • Conclusion of the Unit
3.	**Introduction to Software Testing**
	• Coding, Code Review, documentation. • Testing: - Unit testing, Black-box Testing, White-box testing, • Cyclomatic complexity measure, coverage analysis, mutation testing, • Debugging techniques, Integration testing, System testing, • Regression testing. • Conclusion of the Unit
4.	**Software Quality Management**
	• Introduction to Unit • Overview of SQA Planning • Software configuration management

	• Study of ISO9000 &CMM • Software reverse engineering • Software reengineering • Conclusion of the Unit
5.	**Software Project Management**
	• Introduction to Unit • Various phases of Project Management –Planning– Organizing– Staffing– Directing and Controlling, Metrics for project size estimation • Software Project Cost Estimation–COCOMO models • Software Project Scheduling • CASEtools:CASEdefinitions–CASEClassifications–AnalysisandDesignWorkbenches,Testing Workbenches • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Fundamentals of Software Engineering,	RajibMall	PHI	2018
2.	Software Engineering	I.Sommerville	Pearson Education	Asia
Reference Book				
1	Software engineering, Roger SPressman			
2	An Integrated Approach to Software Engineering, Pankaj Jalote			
Online Resources				
1	https://www.javatpoint.com/software-engineering-tutorial			
2	https://www.geeksforgeeks.org/software-engineering/			
3	https://www.tutorialandexample.com/software-engineering-tutorial			

MAPPING OF CO VS PO/PSO

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

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

Practical

Code:BCACCA2201	Computer Network 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 Programs:

1	Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool
2	Study/Demonstration of Network Devices and network IP in Detail.
3	Troubleshooting Scenarios Network -I (Basic network command and Network configuration commands.
4	Connect the computers with file sharing in Local Area Network.
5	Creating LAN using different topology using Cisco Packet Tracer
6	Configure DHCP Server using Cisco PacketTracer
7	Performing an Initial Switch Configuration.
8	Performing an Initial Router Configuration
9	Configuring WEP on a Wireless Router

MAPPING OF CO VS PO/PSO

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

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

Code:BCACCA2202	Python Programming Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Write Python code, develop medium-difficulty applications in Python
- Implement Python programs with conditionals and loops
- Apply the concept of List and Dictionary.
- Implement Read and write data from/to files in Python
- Develop Python programs step-wise by defining functions

A. LIST OF EXPERIMENTS:

1	Write a python program to compute the GCD and LCM of two numbers.
2	Write python program to perform following operations on Lists: a) Create list b) Access list c) Update list (Add item, Remove item) d) Delete list
3	Write a Python program to remove the —il th occurrence of the given word in a list where words Repeat
4	Write a Python program to count the frequency of words appearing in a string using a dictionary.
5	Write Python program to create a dictionary with key as first character and value as words starting With that character.
6	Write a Python program to check if a substring is present in a given string.
7	Write a Python program to find the intersection and union of two lists.
8	Write a Python program to find the length of a list using recursion.
9	Writer a Python program to read a file and capitalize the first letter of every word in the file.
10	Write a Python program to read the contents of a file in reverse order
11	Write a python program to create a package (Engg), sub -package(years),modules (sem) and create staff and student function to module
12	Write a python program to read 3 subject marks and display pass or failed using class and object

B. 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/			

MAPPING OF CO VS PO/PSO

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

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

Code:BCACCA2203	Linux and Shell Script Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Use shell script to create files and handle text documents
- Create child processes, background process and zombies
- Familiarize basic concepts of shell programming
- Demonstrate use of system calls
- Demonstrate Inter process communication

A. LIST OF EXPERIMENTS:

1	Study and Practice on various commands like man, passwd, tty, script, clear, date, cal, cp, mv,ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, w.
2	Study and Practice on various commands like cat, tail, head , sort, nl, uniq, grep, egrep,fgrep,cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, tar, cpio.
3	a) Write a Shell Program to print all .txt files and .c files. b) Write a Shell program to move a set of files to a specified directory.
4	c) Write a Shell program to display all the users who are currently logged in after a specified time. d) Write a Shell Program to wish the user based on the login time.
5	a) Simulate cat command. b) Simulate cpcommand.
6	a) Simulate head command. b) Simulate tail command.
7	a) Simulate mv command. b) Simulate nlcommand.
8	Write a program to handle the signals like SIGINT, SIGQUIT, SIGFPE.
9	Implement the following IPC forms a) FIFO b) PIPE
10	Implement message queue form of IPC.
11	Implement shared memory form of IPC.
12	Write a Socket program to print system date and time (Using TCP/IP).

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	UNIX Shell Scripting	Randal Michael	2003	Wiley
2.	Bash Cookbook	Carl Albing, JP Vossen	2017	O'Reilly
3.	Linux Command Line and Shell Scripting Bible	Richard Blum , ChristineBresnahan	2015	Wiley
Reference Book				
1.	Linux Command Line and Shell Scripting Bible 4th Edition by Richard Blum			
Online Resources				
1.	https://www.tutorialspoint.com/unix/shell_scripting.htm			
2.	https://www.javatpoint.com/shell-scripting-tutorial			

MAPPING OF CO VS PO/PSO

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

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

Code:BCACCA2204	Software Engineering Lab	1 Credit [LTP: 0-0-2]

A. List of programs

Part - A	
	Below list of experiments focuses on Project Development and Project Management Skill. It gives you complete understanding of scratch to end scenario of any project. **Experiment 1:** Library Management System: The library management system is software, which automates the job of a librarian. **Task-1**: The user can inquire about the availability of a book in which he can search by entering the author's name or by entering the title of the book. **Task -2**: The user can borrow a book. He / She must provide the username and the card number, which is unique and confidential to each user. By confirming the authenticity of a user, the library management system provides information about the number of books already borrowed by the user and by referring to the database whether the user can borrow books or not. The library management system allows the user to enter the title and the author of the book and hence issues the book if it is available. **Task-3**: By entering the user details and the book details the user can return the borrowed book. **Experiment 2:** To develop an AUTOMATED BANKING SYSTEM, which is required to perform the following functions: **Task-1:** The customer logs into the system using card number and pin number. The system checks for validation. **Task-2:** The system queries the customer for the type of account either fixed deposit or credit account. After getting the type of account the system shows the balance left. **Task-3:** The system queries the customer for the transaction type either withdrawal or deposit and the required amount. The user enters the amount and the transaction if carries out. **Experiment 3:** AIRLINE RESERVATION SYSTEM: Ticket reservation system for airlines has to be developed. The system developed should contain the following features: **Task-1:** Search for information about the flight by means of flight number and destination **Task-2:** While displaying information about the flight it has to provide availability of seats. **Task-3:** While reserving tickets the system obtain following information from the user Passenger Name, Sex, Age, Address. Credit Card Number, Bank Name. Flight number, Flight name, Date of Journey and number of tickets to be booked. **Task-4:** Based on the availability of tickets, the ticket has to be issued. The ticket issued should contain the following information –ticket number, flight no, flight name, date of journey, number of passengers, sex, age and departure time. **Task-5:** Cancellation of booked tickets should be available.
Part - B	**Experiment 4:** EMPLOYEE MANAGEMENT APPLICATION: A payroll application is to be developed which is required to perform the following functions:
	Task-1: It must provide a user in employee mode with the details of an employee, which includes his name, department, date of joining and salary. **Task-2:** It must validate an user to enter in administrator mode using password. It must provide a user to enter in administrator mode to view or modify an employee's details using his employee ID. It must also allow the user to add a new employee and delete records of an existing employee. **Experiment 5:** HOSPITAL MANAGEMENT APPLICATION: A hospital application is to be developed which is required to perform the following functions: **Task-1:** It must provide a user in admin mode with the details of a patient, doctor. **Task-2:** It must provide a user in doctor mode who can modify the details of the illness and the treatment.

MAPPING OF CO VS PO/PSO

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

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

Ability Enhancement Courses (AEC)

Code:BULCHU2204	LANGUAGE LAB	1 Credit [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.

A. 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

B. 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, worksheetsInterests • Different Cultures, Clothes, cars, institutes, situations • Schedules, prices • Points to cover: Vocabulary, grammar, Construction of sentences, listeningMethodology: Role plays, Videos, Classroom conversation, worksheets • Conclusion& Real-Life Application

RECOMMENDED 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

Skill Enhancement Courses (SEC)

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

COURSEOUTCOMES:

Students will be able to:

CO.1: Enhance problem solving skills.
CO.2: Prepare for various public and private sector exams & placement drives
CO.3: Communicate effectively & appropriately in real life situation.
CO.4: Improve verbal ability skill among students.
CO.5: Enrich their knowledge and to develop their logical reasoning thinking ability.

LIST OF LABS	
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

Value Added Courses (VAC)

Code: BUVCSA2102	Environment and Sustainability	2 Credits [LTP: 2-0-0]

COURSEOUTCOMES

Students would be able to:

CO1: Understanding of the concept of sustainable development

CO2: Classification of energy resources depending upon their origin and their conservation

CO3: Understanding of the Disaster Management

CO4: Summarize social issues related to population, resettlement and rehabilitation of projectaffected persons

CO5: Understanding of 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 of Sustainable development concept**	5
2.	**Energy resources and conservation**	5
3.	**Disaster Management**	5
4.	**Role of Environment in Human Society**	5
5.	**Field Work**	4

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Sustainable development concept**
	• Introduction of Unit • Concept of sustainability and sustainable development. • Ecosystem: Structure and function of ecosystem • Energy flow in an ecosystem: food chains, food webs and ecological succession. • Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems • Biodiversity and Conservation • Conclusion & Real Life Application
2.	**Energy resources and conservation**
	• Introduction of Unit • Energy resources: Renewable and non-renewable energy sources, use of alternate energysources, 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
3.	**Disaster Management**
	• Introduction of the Unit • Disaster management: floods, earthquake, cyclones and landslides. • Climate change, global warming, ozone layer depletion

	• Acid rain and impacts on human communities and agriculture • Conclusion & Real Life Application
4.	**Role of Environment in Human Society**
	• 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, dissert etc. • Conclusion & Real Life Application

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Natural Resource Conservation – Management for Sustainable Future	Owen, O.S, Chiras, D.D, &Reganold, J.P.	1998	Prentice Hall.
2.	Fundamentals of Materials for Energy and Environmental Sustainability.	Ginley, D.S. &Cahen,D	2011	Cambridge University Press.
3.	Environmental Science.	Miller, T.G.	2012	Wadsworth Publishing Co
4.	Conservation of Natural Resources	Klee, G.A	2001	Prentice Hall Publication.

Semester-III

Major (Core Courses)
Theory

Code: BCACCA3101	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.
- Identify various transaction processing, concurrency control mechanisms and database protection mechanisms.

A.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

A. 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

C. 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	Latest	BPB
3.	Oracle Complete Reference	Kevin Loney	Latest	BPB
Reference Book				
1.	PL/SQL, best practices, BPB Publications, Steven Feuerstein			
2.	The Oracle Cook Book, BPB Publications, Liebschuty			
3.	Oracle A Beginners Guide, TMH Publication, Michael Abbey, Michael J.Corey			
Online Resources				
1.	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm			
2.	https://nptel.ac.in/courses/106106093			
3.	https://www.coursera.org/learn/introduction-to-relational-databases			

MAPPING OF CO VS PO/PSO:

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

Course Code: BCACCA3102	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

A. 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

MAPPING OF CO VS PO/PSO:

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

Code: BCACCA3103	Data Structure and Algorithm	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyse worst-case 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. 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

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 background and definition-Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort • 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 andpostorder. • Graphs • Application of Graphs • Depth First search, Breadth First search. • Conclusion and Real Life Applications of Unit

C.RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Schaum's outline series Data structures	Lipschutz	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 PearsonEducation2005			
2.	Data Structures Using C by-BandyoPadhyay 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

MAPPING OF CO VS PO/PSO:

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

Course Code: BCACCA3104	Computer Organization and 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, interprocessor communication and synchronization.

A. 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.	**Modes of Data Transfer and Memory Organization**	6
5.	**Computer Arithmetic.**	6

B. 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, DE Morgan‘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 Application
4.	**Modes of Data Transfer and Memory Organization**

	• 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

B. RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Computer System Architecture	Morris Mano	Latest	PHI
2.	Computer Organization and Architecture	William Stallings	Latest	PHI
3.	Digital Computer Electronics:	Malvino	Latest	TMH
Reference Book				
1.	Computer Fundamentals Architecture and Organization by Ram B			
2.	Fundamental of Computer Organization and Design by Sivarama P Dandamudi			
Online Resources				
1.	http://nptel.iitm.ac.in/video.php?subjectId=106102062			
2.	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/			

MAPPING OF CO VS PO/PSO:

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

Practical

Course Code: BCACCA3201 Relational Database Management System Lab 1Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- 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 Definition Language (DDL) commands:the basic Data** • CREATE • ALTER • DROP • RENAME • TRUNCATE
2	**The routine operation of the Employee database like retrieve, insert and modify by basic Data Manipulation Language (DML) commands:** • INSERT • UPDATE • 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, AviSilberschatz	6th Edition	McGraw Hill
2	SQL, PL/SQL	Ivan Bayross	Latest	Bpb
3	Oracle Complete Reference	Kevin Loney	Latest	Bpb
Reference Book				
1	PL/SQL-Best practices,BPB Publications, Steven Feuerstein			
2	The Oracle Cook Book,BPB Publications, Liebschuty			
Online Resources				
1	https://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm			
2	https://nptel.ac.in/courses/106106093			
3	https://www.coursera.org/learn/introduction-to-relational-databases			

MAPPING OF CO VS PO/PSO:

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

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

Code: BCACCA3202	OOPS with Java Lab	1Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Implement object oriented programming concepts to solve real world problems
- 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	• Write a program to print ―Hello World‖ in Java. • Write a program to add two numbers • Write a program to demonstrate the different access specifiers • Write a program which uses different packages
2	• Write a program to demonstrate inheritance, abstraction, encapsulation and Polymorphism. • Write a program to find the factorial of n numbers • Write a program to calculate Fibonacci series • Write a program to add n numbers and series
3	• Write a program to create an array and store elements into the array. • Write a program to find the sum of elements in an array • Write a program to demonstrate switch case, if, if-else and for loop
4	• Write a program to demonstrate the working of methods. • Write a program which has four methods – add(), subtract(), multiply() and divide() and demonstrate a simple console calculator. • Write a program to accept command line arguments and display them to the user
5	• Write a program to create a package. • Write a program to handle different exceptions
6	• Write a program to demonstrate try-catch, throw and throws. • Write a program for user defined exception
7	• 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

C. 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	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

MAPPING OF CO VS PO/PSO

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

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

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Code: BCACCA3203	Data Structure and Algorithm Lab	1Credits [LTP: 0-0-2]

COURSE OUTCOME

Students will be able to:

- Write Python code, develop medium-difficulty applications in Python
- Implement Python programs with conditionals and loops
- Apply the concept of List and Dictionary.
- Implement Read and write data from/to files in Python
- Develop Python programs step-wise by defining functions

C. LIST OF EXPERIMENTS:

1	Write a python program to compute the GCD and LCM of two numbers.
2	Write python program to perform following operations on Lists: e) Create list f) Access list g) Update list (Add item, Remove item) h) Delete list
3	Write a Python program to remove the —i‖ th occurrence of the given word in a list where words Repeat
4	Write a Python program to count the frequency of words appearing in a string using a dictionary.
5	Write Python program to create a dictionary with key as first character and value as words starting With that character.
6	Write a Python program to check if a substring is present in a given string.
7	Write a Python program to find the intersection and union of two lists.
8	Write a Python program to find the length of a list using recursion.
9	Writer a Python program to read a file and capitalize the first letter of every word in the file.
10	Write a Python program to read the contents of a file in reverse order
11	Write a python program to create a package (Engg), sub -package(years),modules (sem) and create staff and student function to module
12	Write a python program to read 3 subject marks and display pass or failed using class and object

A. 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

MAPPING OF CO VS PO/PSO

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

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

Minor Stream Courses
Theory

Code: BCTCCA3101	Principles of Virtualization	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be ableto

- Demonstrate Virtualization and able to handle partitions
- Installing the SDDC using VMware products.
- Implementing Fault tolerance and High availability for the Virtual machines
- Securing the Virtual environment.
- Resource Optimization and monitoring.

A. OUTLINE OF THE COURSE:

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction	08
2.	Components of vSphere 6.0	08
3.	Features of vSphere and NSX	08
4.	VSphere Solutions to Data Center Challenges and vSphere Security	08
5.	Resource optimization and resource management	07

B. Detailed syllabus

Unit	Unit Details
1.	**Introduction to Python Programming**
	• Introduction of Unit • Introduction to Virtualization - Types of virtualization - Difference between cloud and virtualization - Physical infrastructure and virtual infrastructure - Virtualization approaches - • Partitioning - Hosting - Isolation - Hardware independence - Virtual machine – Hypervisor - Types of hypervisor - Virtual machine manager - Types of hypervisor - Introduction to datacenter virtualization Esxi - Difference between Esxi and Esx - Versions of Esxi • Conclusion of Unit
2.	**Components of vSphere 6.0**
	• Introduction of Unit • Components of VMware vSphere - vSphere 6.0: Overview and Architecture - Topology of vSphere 6.0 Data Center - vSphere 6.0 Configuration MaximumsvCenter Server - vCenter • Server Features - Certificate Management - Alarms and Alerts - Monitoring Features-Template Management - Linked Mode Deployment - Storage Features in vSphere – Shared Storage - Storage Protocols - Datastores - Virtual SAN - Virtual Volumes – Networking, Features in vSphere - Virtual Networking - Virtual Switches and its types • Conclusion of Unit
3.	**Features of vSphere and NSX**
	• Introduction of Unit • vSphere Resource Management Features - vMotion - Distributed Resource Scheduler (DRS) Distributed Power Management (DPM) - Storage vMotion - Storage DRS - Storage I/O Control - Network I/O Control - vSphere Availability Features - vSphere Data Protection -High Availability -

	Fault Tolerance - vSphere Replication - Introduction to NSX. • Conclusion of Unit
4.	**VSphere Solutions to Data Center Challenges and vSphere Security**
	• Introduction of Unit • Challenges - Availability Challenges - Scalability Challenges - Management Challenges -Optimization Challenges - Application Upgrade Challenges - Cloud Challenges - Security -Describe the features and benefits of VMware Platform Services Controller • host access and authorization - Secure ESXi - vCenter Server - and virtual machines-Upgrade ESXi and vCenter Server instances • Conclusion of Unit
5.	**Resource optimization and resource management**
	• Introduction of Unit • Network Optimization - Configure and manage vSphere distributed switches - Migrate virtual machines from standard switches to distributed switches - Explain distributed switch features such as port mirroring - LACP - QoS tagging - and NetFlow - CPU Optimization – Explain the CPU scheduler operation - NUMA support - and other features that affect CPU performance • Conclusion of Unit

C. **RECOMMENDED STUDY MATERIAL**

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Virtualization Essentials Paperback	Matthew Portnoy		Wiley Publications
2.	VMware Cookbook Paperback	Troy- Shroff		O'Reilly
Reference Book				
3.	Nelson Ruest, Danielle Ruest, Virtualization, A Beginner's Guide, McGraw Hill, 2009, ISBN: 978-0-07-161401-6			
4.	Cloud Computing: Concepts Technology & Architecture ByThomesErl			
Online Resources				
4.	https://www.javatpoint.com/virtualization-in-cloud-computing			
5.	https://www.tutorialspoint.com/virtualization2.0/virtualization2.0_tutorial.pdf			

MAPPING OF CO VS PO/PSO

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

Minor Stream Courses
Practical

Code: BCTCCA3201	Principles of Virtualization Lab	1Credits [LTP: 0-0-2]

Course Outcome:-

Students will be able to:

- Determine Virtualization and identify in Real life use
- Apply Server and Storage Virtualization
- Installing and configuring Vmware
- Apply the concept of vSphere.
- Installing VSAN

A. LIST OF EXPERIMENTS:

1	Desktop Virtualization – Network Virtualization
2	Server and Machine Virtualization
3	Storage Virtualization - System-level or Operating Virtualization
4	Sever Virtualization - Physical and Logical Partitioning - Types of Server Virtualization
5	Installing and configuring ESXi 5.5/6.0 Server [On Premise]
6	Introduction to Management with vCenter Server
7	Introduction to vSphere Networking And Security
8	Introduction to vSphere Storage
9	VSAN 6.6 Setup and Enablement
10	vSAN Scale Out with Configuration Assist
11	vSAN All Flash Capabilities
12	VSANiSCSI Target

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Virtualization 101: Introduction to vSphere	A. S. solanki		TMH
2.	Virtualization Essentials Paperback	Matthew Portnoy		Wiley Publications
Reference Book				
3.	Learning Python Lutz, Mark, O Rielly, 2009			
Online Resources				
4.	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCSA7022.pdf			
5.	https://docs.hol.vmware.com/HOL-2022/hol-2210-01-sdc_pdf_en.pdf			

MAPPING OF CO VS PO/PSO

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

Multidisciplinary Courses
Ability Enhancement Courses (AEC)

Code: BULCHU3208	Communication Skills-I	1 Credit [LTP: 0-0-2]

Course Outcomes:

Students would 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, presentation skills & telephonic conversation by considering the need of the audience.

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1. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Intrapersonal/Interpersonal Skills**	8
2	**Reading Skills**	2
3	**Writing Skills**	4
4	**Listening Skills**	2
5.	**Speaking Skills**	8

A. DETAILED SYLLABUS

LIST OF LABS	
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)

Skill Enhancement Courses (SEC)

Code: BULCSE3201	(Skill Enhancement Generic Course-III)	1 Credit [LTP: 0-0-2]

COURSEOUTCOMES: (Skill Enhancement Generic Course-III) Credit:-1

Students will be able to:

- Enhance problem solving skills.
- Prepare for various public and private sector exams & placement drives
- Communicate effectively & appropriately in real life situation.
- Improve verbal ability skill among students.
- Enrich their knowledge and to develop their logical reasoning thinking ability.

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

Value Added Courses (VAC)

Code: BUVCCE3101	DIGITAL MARKETING	2.0 Credits [LTP: 2-0-0]

COURSE OUTCOMES

Students would be able to:

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

A.OUTLINE OF THE COURSE

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

B. 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 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

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Digital Marketing	Dave Chaffey	7 th	Pearson
2	Social Media Marketing All-in-one Dummies	Jan Zimmerman, Deborah Ng	4 th	John Wiley & SonsInc

Semester-IV

Major (Core Courses)
Theory

Code: BCACCA4101	Big Data Analysis	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
- Recognize the components of Hadoop and Hadoop Eco-System
- Apply Machine Learning Techniques using R

A.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.	**Introduction to Big Data and Hadoop**	**07**

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Big Data**
	• Introduction of Unit • Introduction to Big Data ,Big Data Characteristics • Types of Digital Data, Introduction to Big Data, Big Data Analytics, • Relationships and Representations, Graph Databases. • History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, • Analysing Data with Hadoop, Hadoop Streaming, • Hadoop Echo System, IBM Big Data Strategy, Introduction to InfosphereBigInsights and Big Sheets. • 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 V/S 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 of Unit

D. 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	SeemaAcharya, SubhasiniChellappan	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			

MAPPING OF CO VS PO/PSO

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

Code:BCACCA4102	Design and Analysis of Algorithm	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Apply Divide and conquer. Greedy algorithm design techniques.
- Know the dynamic programming concept with solving real word problem
- Work on Pattern matching algorithms.
- Apply randomize algorithms
- Wok for different class of algorithms and difference between them.

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A.OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction**	**06**
2.	**Dynamic Programming, Branch and Bound**	**06**
3.	**Pattern Matching and Assignment Problem**	**08**
4.	**Randomized Algorithm**	**08**
5.	**NP-Hard and NP-Complete Problem**	**08**

B.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 stresses‘ matrix multiplication algorithm. • Greedy Method: General method, Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spaning Tree, Krushkal Algorithm, Prims Algorithm • Conclusion of Unit
2.	**Dynamic Programming, Branch and Bound**
	• Introduction to Unit • Dynamic Programming: Matrix Chain Multiplication,Longest Common subsequence • Subseuenceand0/1KnapsackProblem,Allpairs shortest path, Flow shop scheduling • Branch And Bound: Traveling Salesman Problem, Bounding, FIFO Branch and Bound, • Backtracking:The8-queensproblem,Hamiltonian cycles Comparison between Dynamic, Backtracking and Branch Bound • Conclusion of Unit
3.	**Pattern Matching and Assignment Problem**
	• Introduction toUnit • 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. • ProbabilisticAnalysis&RandomizedAlgorithms:LasVegasalgorithm,MonteCarlo algorithms for Min-Cut, randomized algorithm for 2- SAT. • Problem definition of Multicommodity 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. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. • Approximation Algorithms for Vertex Cover and Set Cover Problem • Conclusion of Unit

B. RECOMMENDED STUDY MATERIAL

S. No	**Text Books:**	**Author**	**Edition**	**Publication**
1.	Fundamentals of Computer Algorithms	E.Horowitz&S.Sahani	Latest	Galgotia Publications
2.	Introduction to Algorithms	Corman, Leiserson&Rivest	Latest	MIT Press
3	Algorithm Analysis & Design	Goodrich, Tamassia	Latest	Wiley
4.	Introduction To The Design & Analysis of Algorithm	AnanyLevitin	Latest	Pearson Education
Reference Book				
1.	The Algorithm Design Manual by Steve S. Skiena			
2.	Algorithms by Robert Sedgewick& Kevin Wayne			
Online Resources				
1.	http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms			
2.	http://courses.csail.mit.edu/6.006/spring11/notes.shtml			

MAPPING OF CO VS PO/PSO

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

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

Practical

Code: BCACCA4201	Big Data Analysis Lab	1Credit [LTP: 0-0-2]

Course Outcome:-

Students will be able:

- Identify the key issues in big data management and experiment with Hadoop framework.
- Develop problem solving and critical thinking skills in fundamental enabletechniques like Hadoop&MapReduce.
- Construct and Explain with structure and unstructured data by using NoSQLcommands.
- Implement fundamental enabling techniques and scalable algorithms for data streaming.

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 Holmes	2014	Wiley India
2.	Big Data	Black Book	2016	DT Editorial Services
3.	Big Data and Hadoop	V.K. Jain	2017	Khanna Publishers
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			

MAPPING OF CO VS PO/PSO

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

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

Code: BCACCA4202	Design and Analysis of Algorithm Lab	1Credits [LTP: 0-0-2]

Course Outcome: -

Students will be able to:

- Apply divide and conquer method to implement quick sort, merge sort, linear search, and 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 to 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	2014	Kindle
Reference Book				
1.	Data Structures and Algorithms, Made Easy by NarasimhaKarumanchi, Kindle Edition			
Online Resources				
1.	https://www.sanfoundry.com/c-program			

2.	https://www.thecrazyprogrammer.com/2015/03/c-program-for-n-queens-problem-using-backtracking.html

MAPPING OF CO VS PO/PSO

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

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

Minor Stream Courses
Theory

Code: BCTCCA4101	Cloud Web Services	3 Credits [LTP: 3-0-0]

COURSE OUTCOME:

After completion of the course the student will be able to-

- To gain fundamental understanding of AWS cloud technologies
- Be able to start a Windows or Linux server in the cloud with its own private address
- Be able to start up a CRM / Word Press / etc. website hosted in cloud
- Be able to start a highly scalable MySQL or Oracle database in the cloud with multiple read-replica databases (for scalability of database)
- Able to setup a load-balancer in the cloud

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction to Cloud Computing and Amazon Web Services	**8**
2	Introduction to EC2	**10**
3	Web Applications and Security	**10**
4	AWS Storage	**10**
5	AWS Networking	**10**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Cloud Computing and Amazon Web Services**
	● Introduction of Unit ● Introduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS, SAAS), Cloud Deployment Models (Private, Public, Hybrid and Community), Cloud Computing Security, Case Study ● Introduction to Amazon Web Services, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options, AWS Database Options, AWS Workflow Automation and Orchestration Options, AWS Systems Management and Monitoring Options, AWS Virtual Private Cloud Introduction, Pricing Concepts ● Conclusion of the Unit
2.	**Introduction to EC2**
	● Introduction of Unit ● Introduction To EC2, Instance Types And Uses, Auto scaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images of Running Instances, Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types, Elastic IPS, Elastic Load Balancing ● Conclusion of the Unit
3.	Web Applications and Security

	• Introduction of Unit • Introduction to Elastic Beanstalk, Deploying Scalable Application On AWS, Selecting And Launching An Application Environment, Provisioning Application Resources with Cloud formation, Introduction to CloudWatch, Describe Amazon Cloud Watch metrics and alarms, AWS Messaging Services(SNS,SQS,SES). • Introduction to AWS Security, Describe Amazon Identity and Access Management (IAM), AWS Directory Service, AWS Key Management Service, Securing Data at Rest and In Motion • Conclusion of the Unit
4.	AWS Storage
	• Introduction of Unit • Amazon Storage, S3 Storage Basics, Buckets and Objects, Creating A Web Server Using S3 Endpoints, Managing Voluminous Information with EBS • Glacier Storage Service , Describe Amazon Dynamo, Understand key aspects of Amazon RDS, Launch an Amazon RDS instance, • Conclusion of the Unit
5	AWS Networking
	• Introduction of Unit • Introduction to AWS Networking , Access Control Lists (ACLs), Setting Up a Security Group, Setting Up VPC And Internet Gateway, Setting Up A VPN, Setting Up A Customer Gateway For VPN, Setting Up Dedicated Hardware For VPC • Scenario 1:VPC With A Public Subnet Only (Standalone Web) • Scenario 2: VPC with Public And Private Subnets (3 Tier App) • Scenario 3:VPC With Public And Private Subnets And Hardware VPN Access (Web On The Cloud, Database and App On Prem) • Scenario 4: VPC With A Private Subnet Only And Hardware VPN Access. (Extension Of Your Corporate Network), Route53 for DNS System, Cloud front, Case Study • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Publication
1	Cloud Computing: Principles and Paradigms	RajkumarBuyya, James Broberg, Andrzej M. Goscinski	John Wiley and Sons Publications

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA4102	Network Administration	3 Credits [LTP: 3-0-0]

COURSEOUTCOME

Studentswillbeableto:

- To know the different type sofNetworkandtheirconfiguration.
- Troubleshootandconfigurethenetworkanditssecurity.
- Allotaddresstodifferentnodesandnetwork.
- ConfigureRoutersfornetwork.
- ConfiguredifferenttypesofRouters.

A. OUTLINEOFTHECOURS

UnitNo.	TitleofTheUnit	TimerequiredfortheUnit(Hours)
1.	**IntroductiontoNetworkingFundamentals**	**07**
2.	**EthernetLANsandSwitches**	**08**
3.	**IPV4AddressingandSubnetting**	**08**
4.	**LANRouting**	**09**
5.	**Infra-structureServices**	**07**

B. DETAILED SYLLABUS

Unit	UnitDetails
1.	**IntroductiontoNetworksandDevices**
	• IntroductionofUnit • TheTCP/IPandOSINetworkingModels • FundamentalsofEthernet LANs, • FundamentalsofWANs,FundamentalsofIPv4&IPv6 Addressing, • FundamentalsofTCP/IPTransportandApplications • ConclusionofUnit
2.	**EthernetLANsandSwitches**
	• IntroductionofUnit • BuildingEthernetLANswithSwitches, • CiscoLANSwitches,ConfiguringEthernetSwitching, • Configure,verify,andtroubleshootVLANs(normalrange)spanningmultipleswitches, • Configure,verify,andtroubleshootinterswitchconnectivity, • Configure,verify,andtroubleshootportsecurity • ConclusionofUnit
3.	**IPVersion4AddressingandSubnetting**

	• IntroductionofUnit • PerspectivesonIPv4Subnetting,AnalyzingClassfullIPv4Networks • AnalyzingSubnetMasks,AnalyzingExistingSubnets, • ImplementingIPVersion4:OperatingCiscoRouters,Configuring • IPv4AddressesandRoutes,ImplementingEthernetVirtualLANs, • TroubleshootingEthernet,LANs • SpanningTreeProtocolConcepts,TroubleshootingLANSwitching • ConclusionofUnit
.	**LANRouting**
	• IntroductionofUnit • ConfigureIPv4Routing,ConfigureandVerifyHostConnectivity, • AdvancedIPv4AddressingConcepts,DescribethebootprocessofCiscoIOSrouters; • Operationstatusofaserialinterface;ManageCiscoIOSfiles; • RoutingandRoutingProtocols;OSPF(multi-area);EIGRP(singleAS);PassiveInterface. • ConclusionofUnit
5.	**Infra-structureServices**
	• IntroductionofUnit • BasicIPv4AccessControlLists,AdvancedIPv4ACLsandDeviceSecurity, • NetworkAddress,Translation, • Recognizehighavailability(FHRP);DescribeSNMP v2andv3, • ConfigureandverifyDHCP onarouter. • ConclusionofUnit

C. RECOMMENDEDSTUDYMATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	CCNACiscoCertifiedNetwork Associate:StudyGuide			Wiley
2.	CCENT/CCNAICND1640-822OfficialCert Guide3Edition			Pearson
ReferenceBook				
1.	WebApplicationSecurity, ABeginner'sGuideBryanSullivanandVincent Liu,McGrawHill;2012			
OnlineResources				
1.	https://www.edx.org/learn/computer_Security			

MAPPING OF CO VS PO/PSO

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

Minor Stream Courses
Practical

Code: BCTCCA4201	Cloud Web Services Web Lab Cloud Web Services Lab	1Credit [LTP: 0-0-2]

Course Outcome:-

Studentswillbeableto:

- Apply and use Cloud Web Services in Real life
- MakeComparisonofDifferentWebServices
- Implementandusedifferentcoefficient
- Visualizedatawithappropriatevisualtechniques
- ToabletooperateCloud WebServices

A. *LISTOFEXPERIMENTS:*

1	GetExampletoApplyCloudWebServiceinRealLife
2	TakeknowledgeanduseofamazonWebService
3	TakeKnowledgeanduseofGoogleWebService
4	MakeComparisonofDifferentWebServices
5	Tokenizethesentenceintowordsforthefurtheranalysis
6	Normalizethesentencetoeliminatetheunwantedpunctuation,convertingintolowercaseoruppercaseoftheentiredocument,expandingabbreviation,numbersintowordsandcanonicalization.
7	ApplysimilaritymeasuresusingJaccard'sCoefficientorTanimotocoefficient
8	ApplysimilaritymeasuresusingtheSmithWatermandistance
9	Forthegivendatawhatisthemaximumnumberofwordsused.Gettheoutputforthefrequentlyoccurredword inthegivendata?
10	Visualizethegiventextdatawithappropriatevisualtechniques?
11	Getthewordcloudforthegivendataandinterpretwherethemanagementneedtogivehighestattentiontogetthebetterincome?
12	DevelopaBack-offmechanismforMaximumLikelihoodEstimate(MLE)

B. RECOMMENDEDSTUDYMATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	CloudComputing:PrinciplesandParadigms	RajkumarBuyya, JamesBroberg,AndrzejM. Goscinski		John Wiley andSonsPublications

2.	MachineLearningintheAWSCloud	AbhishekMishra	1st	
3.	EffectiveDevOpswithAWS			
ReferenceBook				
1.	MasteringAWSSecurity,"AlbertAnthony",Packt			
2.	AmazonWebServicesinAction2ndEdition			
OnlineResources				
1.	https://www.tutorialspoint.com/amazon_web_services/index.htm			
2.	https://www.w3schools.com/aws/index.php			

A. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Cloud Computing: Principles and Paradigms	RajkumarBuyya, James Broberg, Andrzej M. Goscinski		John Wiley and Sons Publications
2.	Cloud Computing For Dummies	Wesley J. Chun, Prentice Hall	1999	McGraw Hill International Edition
Reference Book				
1.	1Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online – Michael Miller - Que 2008			
Online Resources				
2.	https://www.javatpoint.com/aws-tutorial			
3.	https://www.w3schools.com/aws/index.php			

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA4202	Network Administration Lab	1Credit [LTP: 0-0-2]

CourseOutcome:-
Studentswillbeable to:

- Troubleshootandconfigurethenetworkanditssecurity.
- Allotaddresstodifferentnodesandnetwork.
- ConfigureRoutersfornetwork.
- ConfiguredifferenttypesofRouters.
- Toableto handleanykindof network

.

A. LISTOFEXPERIMENTS:

1	ExecutingofSwitchConfiguration-BasicCommands
2	RecognizeSwitchConfiguration-SwitchPortSecurity
3	SchematizeRouter-Configuration
4	DemonstrateConfigurationofIPAddressforaRouter
5	ClassifySettingupofPasswords
6	ComparePPPEncapsulation,PPPPAPAuthentication,PPPCHAPAuthentication
7	DifferentiateConfigurationofStaticandDynamicRouting
8	AnalyzeConfigurationofDefaultRoute
9	ExecuteImplementationofEIGRP
10	ExecuteImplementation ofOSPF
11	InterpretVLANConfiguration
12	ShowSwitchTroubleshooting

B. RECOMMENDEDSTUDY MATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	CCNACiscoCertifiedNetworkAssociate: StudyGuide			Wiley
ReferenceBook				
1.	UNIXandLinuxSystemAdministrationHandbook5thEdition			
OnlineResources				
1.	https://www.omnisecu.com/index.php			
2.	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwid6LrU6uP4AhUVGrcAHUS1AbwQFnoECCkQAQ&url=https%3A%2F%2Fwww.javatpoint.com%2Fcomputer-network-tutorial&usg=AOvVaw2jEzsmh3wyIR9_RZlE9F3c			

MAPPING OF CO VS PO/PSO

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

Multidisciplinary Courses
Ability Enhancement Courses (AEC)

Code : BULCHU4109 Negotiation skills & Persuasive Communication 2 Credit [LTP: 2-0-0]

COURSE OUTCOMES:

Students would be able to:

- Develop the ability to identify the role of Negotiation skills in everyday life.
- Strengthen the Communication with the proper guidance regarding ethics and role of Human behavior in Negotiation Process.
- Cultivate the habit of reading between the lines and develop the habit of engaging in persuasive communication accordingly.
- Understanding the problems in decision making process and factors hindering the wise and thoughtful decision making.
- Develop the skills to take measured risks in life and to abide by the decisions taken.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction to Negotiation	6
2.	Ethics & Secrets of Powerful Negotiation	6
3.	Trust, Human behavior and Psychology for Negotiation	4
4.	Persuasive Communication	4
5.	Decision Making	5

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Negotiation**
	• Introduction to the Unit • Defining Negotiation • Identify the qualities of successful and unsuccessful negotiators. • Identify different negotiation situations to practice during class • Conclusion & Real-life applications
2.	**Ethics & Secrets of Powerful Negotiation**
	• Introduction to the Unit • Reciprocity. • Publicity • Trust & Universality. • Conclusion & Real-life applications
3.	**Trust, Human behavior and Psychology for Negotiation**

	• Introduction to the Unit • Choosing a negotiation strategy based on relationship and results. • Positional bargaining & identifying the differences between "Soft" and "Hard" negotiating. • Practice Sessions • Conclusion & Real-Life Application
4.	**Persuasive Communication**
	• Introduction to the Unit • Persuasive Communication • Need and Objectives • Difference • Advantages and dis advantages • Conclusion & Real-life applications
5.	**Decision Making**
	• Introduction of the Unit • Meaning and process • Effect of perception on decision making • situations in decision making, Rationality and Bounded rationality. • Conclusion & Real-life applications

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Effective Communication	John Adir	2003	London: Pan Macmillan Ltd.
2.	The Quick and Easy Way to Effective Speaking	Dale Carnegie	1977	New York: Sterling
3.	Speak with Power and Confidence	Collins, Patrick	2009	New York: Sterling
4.	Common Mistakes in English	Fitikides, T. J.	1984	London: Orient Longman

Skill Enhancement Courses (SEC)

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

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	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

Value Added Courses (VAC)

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

COURSE OUTCOMES:

Students would be able to:

- Gain knowledge of Business Intelligence
- Elements of Business Intelligence Solutions
- Build business projects
- Generate and manage BI reports
- BI Deployment, Administration & Security.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (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. DETAILED SYLLABUS

Unit	Unit Details
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 • Conclusion of 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 & Real life applications • Conclusion of the Unit
3.	**Building the BI Project**

	• Introduction of the Unit • Planning the BI project, Project Resources, • Collecting User Requirements, • Validating BI Requirements • BI Design and Development • Conclusion of the Unit
4.	**Reporting Authoring**
	• Introduction of the Unit • 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 • Conclusion of the Unit
5.	**BI Deployment, Administration & Security**
	• Introduction of the Unit • BI Architecture • Expanding BI Authentication Authorization, Access Permissions, Groups and Roles. • Manage Status & Monitoring. • Back Up and Restore • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	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

Semester-V

Major (Core Courses)
Theory

Code : BCACCA5101	Advanced 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.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

B. 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

B. 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/

MAPPING OF CO VS PO/PSO

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

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

Minor Course Stream
Theory

Code: BCTCCA5101	Cloud Deployment	3 Credits [LTP: 3-

COURSE OUTCOME

Students will be able to:

- Gain fundamental understanding of cloud technologies and cloud deployment
- Gain fundamental understanding of AWS cloud technologies
- Able to understand Cloud Migration and its Plan
- Able to handle how to migrate the Services to the Cloud.
- Able to handle Virtual Private Cloud

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction to Cloud Deployment and Services	08
2.	S3, Cloud watch	08
3.	Cloud Migration	07
4.	Migrating Services to Cloud	08
5.	Virtual Private Cloud (Vpc)	07

A. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Cloud Deployment and Services**
	• Introduction of Unit • Introduction to Cloud Deployment Models (Private, Public, Hybrid And Community),Cloud deployment model Security, Differences among different Cloud Deployment Model, Advantages and disadvantages of various cloud computing Deployment model, Google Cloud Platform, Data Center-Based Cloud, Cloud Services Pricing Concepts, Cloud Pricing over Different Deployment Model • Introduction To EC2, Instance Types And Uses, Auto scaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images Off Of Running Instances, Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types, Creating A Web Server Using Ec2, • Conclusion of Unit
2.	**S3, Cloud watch**
	• Introduction of Unit • Introduction To S3, Buckets And Objects, Security, Creating A Web Server Using S3Endpoints, • Introduction To Cloud watch, Creating Alarm Notifications, Auto scaling Instances, Deploying Scalable Application On AWS, • Selecting And Launching An Application Environment, Provisioning Application Resources with Cloud formation.

	• Conclusion of Unit
3.	**Cloud Migration**
	• Introduction of Unit • Introduction to Migration Plan – Migration plan considerations – Time Management, Security, Vendor Selection, Selecting the deployment model, Validating the services to be moved to cloud, Effectiveness of cloud migration, Migration and deployment options, Optimization and Cost Management in an effective cloud migration, Business continuity after Migration, Case Study on Cloud Migration • Conclusion of Unit
4.	**Migrating Services to Cloud**
	• Introduction of Unit • Migrating Services to AWS, Cloud Adoption Framework, Successful Migration, Understanding On-premises cost, Migration cost considerations, Migration options, Three Step processes for large scale services, Successful Migrations, Handling Failures, Risks involved in working at a big scale migration • Conclusion of Unit
5.	**Virtual Private Cloud (Vpc)**
	• Introduction of Unit • Load Balancers And Availability Zones, Elastic Network Interfaces (ENI), Setting Up VPC And Internet Gateway, Setting Up a Security Group, Launching And EC2 Instance And Assigning An ENI, Setting Up A VPN, Setting Up A Customer Gateway For VPN, • Setting Up Dedicated Hardware For VPC • Scenario 1:VPC With A Public Subnet Only (Standalone Web) • Scenario 2: VPC with Public And Private Subnets (3 Tier App) • Scenario 3:VPC With Public And Private Subnets And Hardware VPN Access (Web On The Cloud, Database and App On Prem) • Conclusion of Unit

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Cloud Computing: Principles and Paradigms	RajkumarBuyya, James Broberg, Andrzej M. Goscinski		John Wiley and Sons Publications
2	Cloud Deployment Models A Complete Guide - 2019	GerardusBlokdyk		Kindle publication
Reference Book				
1	Migrating Large-Scale Services to the Cloud, Eric Passmore, Apress			
Online Resources				
1	https://cloud.netapp.com/blog/cloud-migration-strategy-challenges-and-steps			
2	https://www.devopsgroup.com/insights/resources/tutorials/all/cloud-migration/			

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA5102	Cloud Container	3 Credits [LTP: 3-0-0]

COURSE OUTCOME Students will be able to:

- Gain fundamental understanding of Docker Container cloud technologies
- Start a Windows or Linux server in the cloud with its own private address
- Start up a CRM / Word Press / etc. website hosted in cloud
- Determine security of Web Services and implement in use
- Setup a load-balancer in the cloud

A. OUTLINE OF THE COURSE

Unit. No	Title of the Unit	Time required for the unit (Hour)
1	Introduction of Docker	8
2	Docker deployment orchestration	7
3	Docker container	8
4	Web services of docker container	7
5	Mongo DB	8

B. **DETAILED SYLLABUS**

Unit	Unit Details
1	Introduction to Dockers over the cloud computing
	• Introduction of Unit • Introduction to Docker, features of Docker • Important terminology in Docker • Architecture of Docker : Docker Daemon, Dcoker client, host, Docker registry, Dcoker objects • Docker images • Docker Containers • Docker Storage , types • Docker Networking, types • Conclusion of Unit
2	Docker Hub
	Introduction of Docker hub • Docker Hub features • Advantages of docker hub • Push and Pull images from Docker hub • Docker cloud , terminologies of Docker Cloud • Operation of Docker cloud • Dcoker cloud features • Understand the containerization • Container enhance the deployment process • Unit conclusion
3	Docker Linux command environment
	• Running commands inside Docker Container • Docker –user instruction • Docker images • Uses of Docker Images • Difference between Docker images and Dcoker container • Structure of Docker image

	• Conclusion of unit
4	Working with Docker Images
	• Docker images listing. Their names and tags • Filters to list images , Pulling Docker images with specific tags • Publshing images to Docker hub • Docker customized images from container • Conatinerization using Docker • Containerization • Docker architecture, components, compose,network • Advantages of Docker • Conclusion of unit
5	Virtualization with Docker containers
	• Introduction of virtualization with Docker container • Provide the static IP to a Docker container • Docker compose tool to run multi container application • Introduction Docker swarm mode • Working process of Docker Swarm • Used of Docker swarm • Different mode of Docker swarm • Features of Docker swarm • Difference between Docker Container and Docker swarm • Difference between Docker swarm and Kubernetes • Conclusion of unit •

A. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Cloud Computing: Concepts, Technology & Architecture	ZaighamMahmood, Ricardo Puttini, and Thomas Erlwas	2013	by Pearson
2	Cloud Deployment Models A Complete Guide - 2019	GerardusBlokdyk		Kindle publication
Reference Book				
1	Migrating Large-Scale Services to the Cloud, Eric Passmore, Apress			
Online Resources				
1	https://cloud.netapp.com/blog/cloud-migration-strategy-challenges-and-steps			
2	https://www.devopsgroup.com/insights/resources/tutorials/all/cloud-migration/			

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA5103	Cryptography and Cloud Security	3 Credits [LTP: 3-0-0]

COURSEOUTCOME

Studentswillbeableto:

- Comprehendthebasicsofcloudplatformsandriskissuesincloudcomputing.
- Describecloudsecurityarchitecture,challengesandrequirements.
- Toknowthefunctionalityofthedatasecurity.
- Identifyingbestpracticesandstrategiesforasecurecloudenvironment.
- IllustratehowtoperformDesignPatternsincloudplatform.

A. *OUTLINEOFTHECOURSE*

UnitNo.	TitleofTheUnit	TimerequiredfortheUnit(Hours)
1.	**FundamentalsofCloudComputingand ArchitecturalCharacteristics**	**08**
2.	**SecureIsolationofPhysical&Logical Infrastructure**	**09**
3.	**DataProtectionforCloudInfrastructureand Services**	**10**
4.	**EnforcingAccessControlforCloud InfrastructurebasedServices**	**07**
5.	**CloudComputingSecurityDesignPatterns**	**06**

B. DETAILED SYLLABUS

Unit	UnitDetails
1.	**FundamentalsofCloudComputingandArchitecturalCharacteristics**
	• IntroductionofUnit • Understand whatisCloudcomputing • ArchitecturalandTechnologicalInfluencesofCloudComputing • UnderstandtheClouddeployment models • Public,Private,CommunityandHybridmodels • Scope ofControl S • SoftwareasaService(SaaS) • PlatformasaService(PaaS) • InfrastructureasaService(IaaS) • CloudComputingRolesRisksandSecurityConcerns • ConclusionofUnit
2.	**SecureIsolationofPhysical&LogicalInfrastructure**

	• IntroductionofUnit. • Compute,NetworkandStorage. • Commonattackvectorsandthreats. • SecureIsolationStrategies. • Multitenancy,Virtualizationstrategies. • Inter-tenantnetworksegmentationstrategies. • Storageisolationstrategies. • ConclusionofUnit.
3.	**DataProtectionforCloudInfrastructureandServices**
	• IntroductionofUnit • UnderstandtheCloudbasedInformationLifeCycle • Dataprotectionfor ConfidentialityandIntegrity • Commonattackvectorsandthreats • Encryption,DataRedaction,Tokenization,Obfuscation,PKIandKey • Management,Assuringdatadeletion • Dataretention,deletionandarchivingproceduresfortenantdata • DataProtectionStrategies • ConclusionofUnit
4.	**EnforcingAccessControlforCloudInfrastructurebasedServices**
	• IntroductionofUnit • Understandtheaccesscontrolrequirements forCloudinfrastructure • Commonattackvectorsandthreats • EnforcingAccessControlStrategies • Compute,NetworkandStorage • Authenticationand Authorization • Roles-basedAccessControl,Multi-factorauthentication • Host,storageand networkaccesscontroloptions • OSHardeningandminimization,securingremoteaccess,Verifiedand measuredboot • Firewalls,IDS,IPSandhoneypots • ConclusionofUnit
5.	**CloudComputingSecurityDesignPatterns**
	• IntroductionofUnit • SecurityPatterns forCloudComputing • TrustedPlatform • Geo-tagging • CloudVMPlatformEncryption • TrustedCloudResourcePools • SecureCloudInterfaces • CloudResourceAccessControl • CloudDataBreachProtection • PermanentDataLossProtection • In-TransitCloudDataEncryption • ConclusionofUnit

A. RECOMMENDEDSTUDYMATERIAL.

S.No	TextBooks:	Author	Edition	Publication
1.	Cloud SecurityandPrivacy	Tim Mather, SubraKumaraswamy,and ShahedLatif		O'Reilly
2.	CryptographyforSecurityandPrivacyin CloudComputing	DanielSlamanig		
ReferenceBook				
1.	CryptographyforSecurityandPrivacyinCloud Computing			
2.	NetworkSecurityandCryptography			

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA5104	Advanced Cloud Technology	3 Credits [LTP: 3-0-0]

COURSE OUTCOME:

Students will be able to:

- Describe the types of medical robots and the concepts of navigation and motion replication.
- Discuss about the sensors used for localization and tracking
- Summarize the applications of surgical robotics
- Outline the concepts in Rehabilitation of limbs and brain machine interface
- Classify the types of assistive robots. Analyze the design characteristics, methodology and technological choicesfor medical robots

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Introduction	**07**
2.	Communications and Networking in the Cloud Computing &Protocols	**08**
3.	Fundamentals Of Online Robots &IOT Architecture	**08**
4.	Mobile Robots and Cloud Computing with Web of Things	**07**
5.	Remote Mobility in the Cloud Computing &IOT Applications	**07**

B. DETAILED SYLLABUS

Unit	Unit Details
	Introduction
1.	• Introduction of Unit • Overview and background, Brief history of cloud computing and robotics. • Network Robotics, ROS, MatLab • Data Center and remote-device communication , Wireless network and Robot • Different Types of Antennas &Characteristics of Antenna • Privacy and Security Issues in the cloud network. • Conclusion of Unit
2.	**Communications and Networking in the Cloud Computing &Protocols**
	• Introduction of Unit • The Internet ,Wired Communication Links • Wireless Links – Properties of Networked Telerobotics • Building a Networked Telerobotic system • State command Presentation ,Command Execution/ State Generation , Collaborative Control • Protocol Standardization for IoT , Efforts – M2M and WSN Protocols • SCADA and RFID Protocols ,Issues with IoT Standardization , • Unified Data Standards – Protocols – IEEE802.15.4 • BACNet Protocol– Modbus – KNX – Zigbee • Network layer ,APS layer , Security • Conclusion of Unit
3.	**Fundamentals Of Online Robots & IOT Architecture**

	• Introduction of Unit • Introduction – Robot Manipulators , Teleoperation – Teleoperation on a local network • Teleoperation via a constrained link. • IoT Open source architecture (OIC), OIC Architecture &Design principles
	• IoT Devices and deployment models- IoTivity : An Open source IoT stack • Overview-IoTivity stack architecture,Resource model and Abstraction. • Conclusion of Unit
4.	Mobile Robots and Cloud Computing with Web of Things
	• Introduction of Unit • Introduction to networked robot system on the Web, Software Architecture and design – Interface design. • Web of Things versus Internet of Things ,Two Pillars of the Web • Architecture Standardization for WoT, Platform Middleware for WoT • Unified Multitier WoT Architecture • WoT Portals and Business Intelligence. • Conclusion of Unit
5.	Remote Mobility in the Cloud Computing & IOT Applications
	• Introduction of Unit • Autonomous Mobile Robot on the Web , • Mobile Mini Robots ,Performance of Mobile Robots controlled through WEB • Handling Latency in Internet based Tele operation • Case Study Computer Networked Robotics • Online Robots and the Robot Museum. • IoT applications for industry: Future Factory Concepts, Brownfield IoT • Smart Objects, Smart Applications. Study of existing IoT platforms /middleware • IoT- A, Hydra etc. • Conclusion of Unit

RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Handbook of Cloud Computing	BorkoFurht, Armando Escalante	2010	Springer Science &Business,
2.	Cloud Robotics – Distributed Robotics using Cloud Computing	Joao Pedro, Carvalho Rosa,	2016	Coimbra
Reference Book				
1.	Robots and Sensor Clouds			
2.	Networking Humans, Robots and Environments			
3.	Emergent Trends in Robotics and Intelligent Systems			
Online Resources				

1.	https://www.simplilearn.com/cloud-solutions-architect-masters-program-training?utm_source=google&utm_medium=cpc&utm_term=cloud%20course&utm_content=17438038281-138244819140-602766657095&utm_device=c&utm_campaign=Search-TechCluster-Cloud-AbsoluteBroadKeywords-IN-Main-AllDevice-adgroup-Cloud-Course-Broad&gclid=EAIaIQobChMIra3uw7Gs-AIVEBsrCh0BAgqsEAAYASAAEgLJlvD_BwE
2.	https://www.ibm.com/in-en/cloud/internet-of-things?utm_content=SRCWW&p1=Search&p4=43700052658173554&p5=e&gclid=EAIaIQobChMInZHDz 7Gs-AIVvp1LBR0V-gHmEAAYASAAEgLJpfD_BwE&gclsrc=aw.ds

MAPPING OF CO VS PO/PSO

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

Minor Course Stream
Practical

Code: BCTCCA5201	Cloud Deployment Lab	1Credit [LTP: 0-0-2]

Course Out come :
After completion of the course the student will be able to-

- To gain fundamental understanding of AWS cloud technologies
- Be able to start a Windows or Linux server in the cloud with its own private address
- Be able to start up a CRM / Word Press / etc. website hosted in cloud
- Be able to start a highly scalable MySQL or Oracle database in the cloud with multiple read-replica databases (for scalability of database)
- Be able to setup a load-balancer in the cloud.

A.List of programs

	1. Introduction to Amazon Simple Storage Service (S3) 2. Introduction to Amazon Cloud Front 3. Introduction to AWS Key Management Service 4. Introduction to Amazon Elastic search Service 5. Introduction to Amazon Dynamo DB 6. Introduction to Amazon API Gateway 7. Introduction to Amazon Redshift 8. Introduction to Amazon Aurora 9. Introduction to Amazon Machine Learning 10. Introduction to AWS Database Migration Service 11. Introduction to AWS Lambda 12. Introduction to AWS Internet-of-Things (IoT) 13. Introduction to AWS Device Farm 14. Introduction to Amazon Kinesis Firehose 15. Introduction to Amazon Route 53

A. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Cloud Computing: Principles and Paradigms	RajkumarBuyya, James Broberg, Andrzej M. Goscinski		John Wiley and Sons Publications
2	Cloud Deployment Models A Complete Guide - 2019	GerardusBlokdyk		Kindle publication
Reference Book				
1	Migrating Large-Scale Services to the Cloud, Eric Passmore, Apress			
Online Resources				
1	https://cloud.netapp.com/blog/cloud-migration-strategy-challenges-and-steps			
2	https://www.devopsgroup.com/insights/resources/tutorials/all/cloud-migration/			

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA5202	Cloud Container Lab	1Credit [LTP: 0-0-2]

COURSE OUTCOME Students will be able to:

- Gain fundamental understanding of Docker Container cloud technologies
- Start a Windows or Linux server in the cloud with its own private address
- Start up a CRM / Word Press / etc. website hosted in cloud
- Determine security of Web Services and implement in use
- Setup a load-balancer in the cloud

LIST OF ACTIVITIES	
1	Installation Docker on Ubuntu
2	Create an application in Docker
3	Push an image to Docker Hub
4	Fetch and run the image from Docker Hub
5	Creating first repository in Docker Hub using GUI
6	How to Push and Pull images from Docker Hub
7	Deploy the Containerization Process
8	Docker installation process in windows
9	Create a Docker image and run it as container
10	Create a repository on Docker Hub
11	How to provide the static IP to a Docker container
12	Migration of containers

MAPPING OF CO VS PO/PSO

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

Code: BCTCCA5203	Cryptography and Cloud Security Lab	1Credit [LTP: 0-0-2]

Course Outcome:

Studentswillbeable to:

- Toknowthefunctionalityofthedatasecurity.
- Identifyingbestpracticesandstrategiesforasecurecloudenvironment.
- Toknowtheimplementationofvarioustechniquesand securityalgorithms.
- IllustratehowtoperformDesignPatternsincloudplatform.
- ImplementNetworkorientedtechniqueusingCloudserver

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A. LISTOFEXPERIMENTS:

1	Designingofsamplecloudservices.
2	ToImplementandBreakShiftCipher
3	ToImplementMono–AlphabeticCipher
4	ToImplementOne–TimePadCipher
5	ToImplementMessageAuthenticationCodes(MD5)
6	ToImplementCryptographicHashFunction(SHA-256)
7	ToImplementSymmetricEncryptionCipherDES
8	ToImplementSymmetricEncryptionCipherAES
9	ToImplementDiffie–HellmanKeyEstablishment
10	ToImplementPublic–KeyCryptosystems(RSA)
11	ToImplementDigitalSignatures(DSA)
12	DevelopaHelloWorldapplicationusingGoogleAppEngine.

A. RECOMMENDEDSTUDY MATERIAL

S. No	TextBooks:	Author	Edition	Publication
1	Cloud SecurityandPrivacy	TimMather,Subra Kumaraswamy, andShahedLatif		O'Reilly
2.	CryptographyforSecurityandPrivacyin CloudComputing	DanielSlamanig		
ReferenceBook				
1.	CryptographyforSecurityandPrivacyinCloud Computing			
2.	NetworkSecurityandCryptography			
OnlineResources				
1.	GoogleCyberSecurityTag			
2.	https://cloudlabs.ai/virtual-labs-for-cyber-security/			

MAPPING OF CO VS PO/PSO

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

Multidisciplinary Courses
Ability Enhancement Courses (AEC)

Code: BULCHU5115	Entrepreneurial and Managerial Skills	2Credits [LTP: 2-0-0]

COURSE OUTCOMES:

Students would be able to:

- Demonstrate an integrated awareness of Entrepreneurship and its link to professional life.
- Understand and analyze the concepts of Entrepreneurship Development and various Entrepreneurship models.
- Understand the role of effective leadership in organizational strategy & propose appropriate leadership styles and approaches through evaluation of dynamic leadership
- Comprehend the behaviors and issues relating to leadership.
- Develop practical, ethically-informed leadership skills that can be applied in a range of situations.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Entrepreneurship	7
2.	Entrepreneurship Development	8
3.	Leadership Styles: Effective Vs Successful Managers.	7
4.	Behavioral Theory of Leadership.	5
5.	Leadership Styles: Case Study and Adaptation.	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Entrepreneurship**
	● Introduction to the Unit ● Concept of Entrepreneur. Intrapreneur, Entrepreneurship and Manager ● Difference between Entrepreneur and Intrapreneur, Entrepreneur and Entrepreneurship. Attributes and Characteristics of successful entrepreneurs. Functions of an Entrepreneur ● Classification of Entrepreneurs. Role of Entrepreneur in Indian Economy, Developing entrepreneurial culture, Factors influencing Entrepreneurship Growth - Economic, Non-Economic Factors, For profit or Not for profit entrepreneurs, Constraints for the Growth of Entrepreneurial Culture, Entrepreneurship as a career ● Entrepreneurship as a style of management, Emerging Models of Corporate Entrepreneurship, India's start up revolution–Trends, Imperatives, benefits; the players involved in the ecosystem, Business Incubators-Rural ● entrepreneurship, social entrepreneurship, women entrepreneurs, Cases of Tata, Birlas, Kirloskar and new generation entrepreneurs in India.

	• Conclusion & Real-life applications
2.	**Entrepreneurship development**
	• Introduction to the Unit • Entrepreneurial Competencies, Developing Competencies. • Concept of entrepreneurship development, Entrepreneur Training and developing, Role of Entrepreneur Development Programs (EDP) • Objectives – contents – methods - execution. Role of Mentors • Innovation and Entrepreneurship, Design Thinking Process. Role of consultancy organizations in promoting Entrepreneurs • Problems and difficulties of Entrepreneurs - Marketing Finance, Human Resource, Production; Research - external problems • Mobility of Entrepreneurs, Entrepreneurial change, occupational mobility - factors in mobility • Conclusion & Real-life applications
3.	**Leadership Styles: Effective Vs. Successful Managers**
	• Introduction to the Unit • Types of Leadership Style • Types of Management Styles • Distinction between Effective Leadership and Effective Management • Conclusion & Real-life applications
4.	**Behavioral theory of Leadership**
	• Introduction to the Unit • Definition of Behavioral Theory • Classification of Behavioral theory • Conclusion & Real-life applications
5.	**Leadership Styles: Case Study and Adaptation**

	• Introduction to the Unit • Peter Weaver Case Study • Dealing with Crisis: Case Study • Arsenic and Old Lace Case Study • Conclusion & Real-life applications

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Leadership Development	John Mitchell	*2012*	Mitchell Leadership Consulting
2.	Leading Minds: An Anatomy of Leadership	Howard E. Gardner and Emma Laskin	*2011*	Kogan Page
3.	Start with Why: How Great Leaders Inspire Everyone to Take Action,	Simon Sinek	2011	Portfolio
4.	Strengths-Based Leadership	Tom Rath and Barry Conchie	2009	Gallup Press

Skill Enhancement Courses (SEC)

Course Code:BULCSE5201	Skill Enhancement Generic Course –V	1 Credit[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	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

Value Added Courses (VAC)

Code: BUVCCE5102	INTERNET OF THINGS	2.0 Credits [LTP: 2-0-0]

COURSE OUTCOME

Students would be able to

- Describe general concepts of Internet of Things (IoT) and identify various devices, sensors and applications
- Understand the design concept of sensors and sensor networks
- Apply different wireless technologies for IoT
- Apply technologies for basic IoT applications
- Understand the design concept of sensors and sensor networks

A.OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time Required for the Unit (Hours)
1	**Introduction to IOT**	5
2	**Sensor Networks**	5
3	**Wireless Technologies**	5
4	**IOT Application Development**	5
5	**Applications of IOT**	4

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to IOT**
	• Introduction of the Unit • IoT Definition, Characteristics of IoT • Functional Blocks, Physical design of IoT, Logical design of IoT • Communication models & APIs • Networking basics • Communication Protocols • Conclusion of the Unit
2	**Sensor Networks**
	• Introduction of the Unit • Types of Sensors, Types of Actuators, Examples and Working • IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit • Wireless Sensor Networks: History and Context, The node, Connecting nodes, • Networking Nodes, WSN and IoT • Conclusion of the Unit
3	**Wireless Technologies**
	• Introduction of the Unit • WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE • Remote monitoring and sensing • Communication pattern, 6LoWPAN • Conclusion of the Unit
4	**IOT Application Development**
	• Introduction of the Unit • Introduction to Node MCU • Node MCU Pin Description • Programming of NodeMCU using Arduino IDE • IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. • Bigdata, Types of data, Characteristics of Big data • Cloud Computing Platforms for IoT • Conclusion of the Unit

5	**Applications of IOT**
	• Introduction of the Unit • Home Automation, Smart Cities, Energy, Retail Management, Logistics • Agriculture, Health and Lifestyle, Industrial IoT, • Legal challenges, IoT design Ethics, • IoT in Environmental Protection • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1	Internet of Things: Architectures, Protocols and Standards	Simone Cirani, Gianluigi, Marco, and Luca Veltri	Latest	Wiley
2	Internet of Things	RMD SundaramShriramKVasudevan, Abhishek S	Latest	Wiley
3	Designing the Internet of Things	Adrian McEwen, Hakim Cassimall Y	Latest	John Wiley and Sons
4	Internet of Things (A Hands-on Approach)	Vijay Madisetti and ArshdeepBahga	2014	VPT

Semester-VI

Major (Core Courses)
Theory

Code:BCACCA6101	IPR and Patent	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

- This course is an overview of the intellectual property law: patents, copyrights, trade secrets, and trademarks.
- It examines the fundamental principles of these bodies of law, their underlying policies, and how the laws inter-relate.
- Pupils will learn about patents and its importance and how to apply & get approval.
- Study will understand about trademarks and intellectual property law.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time Required for the Unit (Hours)
1	**Introduction to IPR**	7
2	**Types of IPR and WIPO**	7
3	**Legal and Commercial Aspects of IPR**	7
4	**Introductions to Patents**	7
5	**Patent Procedures**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to IPR**
	• Introduction of Unit • General Regime of Intellectual Property Rights, Concept of Property vis-à-vis Intellectual Property, Concept of Property and Theories of Property - An Overview. • Theories of Intellectual Property Rights, Intellectual Property as an Instrument of Development, Need for Protecting Intellectual Property- Policy Consideration- National Perspectives and International demands • Conclusion of Unit
2	**Types of IPR and WIPO**
	• Introduction of Unit • Types of Intellectual Property- Origin and Development- An Overview, Intellectual Property Rights as Human Right, Role of International Institutions, World Intellectual Property Organization (WIPO), Function of WIPO, Membership of WIPO, Agreement between the WIPO and the WTO • Conclusion of Unit
3	**Legal and Commercial Aspects of IPR**
	• Introduction of Unit • Dispute Settlement- New Treaties, Commercialization of Intellectual Property Rights by Licensing • Determining Financial Value of Intellectual Property Rights, Negotiating Payments Terms in Intellectual Property Transaction • Intellectual Property Rights in the Cyber World • Conclusion of Unit
4	**Introductions to Patents**
	• Introduction of Unit • Introduction to Patent Law, Paris Convention, Patent Cooperation Treaty, WTO-TRIPS, Harmonization of CBD and TRIPs, Indian Patent Law, The Patents Act, 1970, Amendments to the Patents Act, Patentable Subject Matter, Patentability Criteria

	• Conclusion of Unit
5	**Patent Procedures**
	• Introduction of Unit • Procedure for Filing Patent Applications, Patent Granting Procedure, Revocation, Patent Infringement and Remedies, Relevant Provisions of the Biological Diversity Act, 2002, Access and Benefit Sharing Issues • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. N.	Book	Author	Publication
1	Intellectual Property Rights in India	VK Ahuja	Lexis Nexis, butter worth, s wadhwa
2	Intellectual Property Rights	NeerajPandey (Author), KhushdeepDharni	PHI Learning

MAPPING OF CO VS PO/PSO

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

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

Minor Stream Courses
Theory

Code: BCTCCA6101	Cloud migration and Data Center	3 Credits [LTP: 3-0-0]

COURSEOUTCOME

Studentswillbeableto:

- Thefundamentalideasbehind loudComputing,theevolutionoftheparadigm,itsapplicability;benefits,aswellascurrentandfuture challenges.
- Thebasicideasand principlesindatacenterMigration;cloud developmenttechniques.
- ThebasicideasandprinciplesindatacenterMigrationandcloudservicesdeploymentconsiderations.
- Cloudstoragetechnologiesandrelevantdistributedfilesystems.
- ToabletohandleDataCenterVirtualization.

A. *OUTLINEOFTHECOURSE*

UnitNo.	TitleofTheUnit	Timerequiredforth eUnit(Ho urs)
1.	**MigratingintoaCloud**	**7**
2.	**CloudMigrationPlan&MigratingServicestoCloud**	**8**
3.	**MigratingLargescaleservicestothecloud&CloudDat aCenter**	**8**
4.	**DataCenterNetworking&DataCenterStorage-Area Networking.**	**6**
5.	**DataCenterServerVirtualization&DataCenterNe tworkServices**	**7**

B

B.DETAILED SYLLABUS

Unit	UnitDetails
1.	**MigratingintoaCloud**
	• IntroductionofUnit • Introduction,ChallengeswhilemigratingtoCloud, • Broad approaches to migrating into the cloud why migrate -deciding on cloud migration, the Seven-stepmodelofmigrationinto a cloud, MigrationRisksandMitigation, • EnterprisecloudcomputingparadigM,relevantDeploymentModelsforEnterpriseCloudComputing, • AdoptionandConsumptionStrategies,issues forenterpriseapplicationsonthecloud • ConclusionofUnit
2.	**CloudMigrationPlan&MigratingServicestoCloud**
	• IntroductionofUnit • Introduction to Migration Plan, Migration plan considerations , Time Management, Security, VendorSelection, Selecting the deployment model, Validating the services to be moved to cloud, Effectivenessofcloudmigration, • Migrationanddeploymentoptions,OptimizationandCostManagementinaneffectivecloudmigration, • BusinesscontinuityafterMigration, CaseStudyonCloud Migration • MigratingServicestoAWS,CloudAdoptionFramework,SuccessfulMigration • UnderstandingOn-premisescost,Migrationcostconsiderations,Migrationoptions. • ConclusionofUnit

3	**MigratingLargescaleservicestothecloud&CloudDataCenter**
	• IntroductionofUnit • Three Step processes for large scale services, Successful Migrations, Handling Failures, Risks involvedin workingat a bigscalemigration, • Pre-releaseanddeploymentconsiderations,MonitoringandAlerting,Mitigation • Introduction Cloud and data centers ,Data Center Networks, Software-Defined Networking (SDN) ,VirtualizationandParallel Programming, • TrafficEngineeringinDataCenters,TaskSchedulinginDataCenters,CongestionControlinData Centers • ConclusionofUnit.
4.	**DataCenterNetworking&DataCenterStorage-Area Networking.**
	• IntroductionofUnit • DataCenterNetworkArchitecture,CiscoNexusProductFamily,VirtualizingCiscoNetworkDevices • DataCenterInterconnect,ManagementandMonitoringofCiscoNexusDevices • DataCenterStorage Architecture,CiscoMDSProductFamily,VirtualizingStorage • FibreChannel Storage-AreaNetworking,DataCenterBridgingandFCoE,MultihopUnifiedFabric • ConclusionofUnit
5.	**DataCenterServerVirtualization&DataCenterNetworkServices**
	• IntroductionofUnit • CiscoUnifiedComputingSystemArchitecture,CiscoUnifiedComputingSystemManager • CiscoUnifiedComputingSystemPools,Policies,Templates,andServiceProfiles, Administration,Management,andMonitoringofCisco UnifiedComputing System • CiscoNexus1000VandVirtualSwitching,CiscoACEand GSS,CiscoWAASand Application Acceleration • ConclusionofUnit

A. RECOMMENDED STUDY MATERIAL

S.No	**TextBooks:**	**Author**	**Edition**	**Publication**
1.	MigratingLarge-ScaleServices totheCloud	EricPassmore		Apress
2.	CloudNativeDataCenterNetworking	DineshG.Dutt		O‟Reilly
ReferenceBook				
1.	DataCenterforBeginners:Abeginner's			
2.	DataCenterHandbook			
OnlineResources				
1.	https://datacenters.lbl.gov/dcep			
2.	https://www.cisco.com/c/en/us/training-events/training-certifications/certifications/meraki-solutions.html			
3.	https://www.cnet-training.com/			

MAPPING OF CO VS PO/PSO

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

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Minor Stream Courses
Practical

Code: BCTCCA6201	Cloud migration and Data Center Lab	1Credit [LTP: 0-0-2]

Course Outcomes:

Students will be able to:

- Understand the core concepts and principles of cloud migration and data center management in AWS, including virtualization, networking, and security.
- Gain practical hands-on experience in provisioning and managing AWS resources, such as EC2 instances, VPCs, load balancers, and databases.
- Develop proficiency in implementing cloud migration strategies, including data transfer to AWS S3, database migration to AWS RDS, and content delivery using CloudFront.
- Master key AWS services for monitoring, logging, access control, and disaster recovery, enabling effective resource management and security in the AWS cloud.
- Acquire knowledge of cost optimization strategies, understanding AWS billing models, and implementing cost-effective solutions to manage cloud infrastructure efficiently.

A. List of Experiments:

1	Create and manage virtual machines (EC2 instances) in AWS to support application migration.
2	Configuring VPC and Subnets
3	Set up Virtual Private Cloud (VPC) and subnets to isolate and secure network resources.
4	Implementing Load Balancers
5	Setting up Auto Scaling
6	Migrating Data to AWS S3
7	Database Migration to AWS RDS
8	Implementing CDN with Cloud Front
9	Configuring AWS IAM
10	Monitoring and Logging with CloudWatch
11	Disaster Recovery and Backup
12	Cost Optimization and Resource Management

A. RECOMMENDED STUDY MATERIAL

S.No	TextBooks:	Author	Edition	Publication
1.	MigratingLarge-ScaleServices totheCloud	EricPassmore		Apress
2.	CloudNativeDataCenterNetworking	DineshG.Dutt		O‟Reilly
ReferenceBook				
1.	DataCenterforBeginners:Abeginner's			
2.	DataCenterHandbook			
OnlineResources				
1.	https://datacenters.lbl.gov/dcep			
2.	https://www.cisco.com/c/en/us/training-events/training-certifications/certifications/meraki-solutions.html			
3.	https://www.cnet-training.com/			

MAPPING OF CO VS PO/PSO

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

Multidisciplinary Courses
Ability Enhancement Courses (AEC)

Code: BULCHU6120	Presentation and Interview Skills	2 Credits [LTP: 2-0-0]

Course Outcome:-

Students will be able

- On successful completion of the course, the students will be able to:
- Compare the professional and personal approaches to any task and demonstrate their understanding by displaying a professional attitude in the assigned tasks.
- Recognize, explain, and use the formal elements of specific genres of organizational communication: reports, proposals, memorandums, web pages, wikis, blogs, business letters, promotional documents, etc
- Prepare and deliver a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.
- Demonstrate preparedness for any type of interview from classic one-on-one interviews to panel interviews, Phone/Skype interviews, Behavioral/Situational, etc. along with sharpening 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.

A. OUTLINE OF THE COURSE

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

B. DETAILED SYLLABUS

UNIT	UNIT NAME
1	**Professional Attitude & Approach**
	• Introduction to the Unit • Understanding Human behavior • Relationships between truth and beliefs • Positive Thinking • Adaptability and resilience • Adaptability in the workplace • Self -Awareness • Conclusion &Real-Life Application
2	**Professional Writing**
	• Introduction to the Unit

	• Technical Writing • Formal Letter Writing • Job applications • Notice Agenda and Minutes of Meeting • CV preparation (differences between Bio-Data, CV, and Resume) • Report Writing (Business Reports, Memo Reports) • Email Communication • Conclusion &Real-Life Application
3	Presentation Skills: Structure Study
	• Introduction to the Unit • Oral Presentation: Voice modulation, tone, describing a process • Presentation Skills: Oral presentation and public speaking skills • Business presentations • Preparation: organizing the material, Self-Introduction, introducing the topic, answering questions, individual presentation practice, and presenting visuals effectively. • Conclusion &Real-Life Application
4	**Interview Skills & Group Discussion**
	• Introduction to the Unit • Interview Skills: types of interviews, successful interviews, • Interview etiquette, dress code, body language • Online Job Interview: Telephone/online (skype) interviews • Offline Job Interviews: One-to-one interviews & panel interviews • Mock Interviews • Introduction to Group Discussion (GD) • Differences between GD and debate • Participating in GD, understanding GD, brainstorming the topic, questioning and clarifying • GD strategies • Conclusion &Real-Life Application

5	Negotiation Skills & Time Management
	• Introduction to theUnit • Recognizing differences between groups and teams • Time Management • Stress Management • Networking professionally • Respecting social protocols • Understanding career management • Develop a long-term career plan • Points of view • Agreement-Disagreement • Discussion techniques • Situations and negotiators • Difficulties in negotiation and reaching an agreement • Conclusion &Real-Life Application

B. Recommended Readings:

Sr. No	Reference Book	Author	Edition	Publication
1.	English for Engineers and Technologists		(Combined edition, Vol. 1 and 2)	1. Orient Blackswan 2010.
2.	The Elements of Style	William Strunk Jr. & E.B. White	4th Edition	Pearson, 1999.
3.	Technical Communications	Raman Sharma	London, 2004	Oxford Publication
4.	Success in Interview	Anand Ganguly	5 Edition, 2016	RPH

Skill Enhancement Courses (SEC)

Code:	**BULCSE6201**	Skill Enhancement Generic Course-VI	1 **Credit**	**[LTP: 0-0-2]**

COURSEOUTCOMES:

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	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