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BHARATI VIDYAPEETH

(Deemed to be University), Pune

'A++' Accreditation (Third Cycle) by

'NAAC' in 2024 Category-I Deemed to be

University Graded by UGC

'A' Grade University Status by MHRD Govt. of

India.

FACULTY OF MANAGEMENT STUDIES

BACHELOR OF COMPUTER APPLICATION

DEGREE

(THREE YEARS) / HONORS (FOUR YEARS)

FRAMED AS PER NATIONAL EDUCATION POLICY

(NEP 2020)

SYLLABUS

Applicable with effect from 2022-23

Contents

Bharati Vidyapeeth (Deemed to be University), Pune
Faculty of Management Studies

Bachelor of Computer Application (Honors) FOUR YEARS

Revised Course Structure (To be effective from 2022-2023)

I. Preamble :

The Bachelor of Computer Application (Honors) Programme is a full time four year programme offered by BharatiVidyapeeth (Deemed to be University), Pune and conducted in Regular mode at its management institutes located in New Delhi, Pune, Navi Mumbai, Kolhapur, Sangli, Karad and Solapur. All the seven institutes have excellent faculty members, computer laboratories, Libraries, and other facilities to provide proper learning environment to the students. The University is accredited by NAAC with 'A+' grade. The expectations and requirements of the SoftwareIndustry, immediately and in the near future, are considered while designing the BCA programme. While designingthe BCA Programme , the above facts are considered and the requirements for higher studies and immediate employment are visualized. This effort is reflected in the Vision and Mission statements of the BCA programme, the statements also embody the spirit of the vision of Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth ―"Social Transformation Through Dynamic Education"

II. Vision:

Preparing the Students to cope with the rigor of Post Graduate Programmes in global and creating high calibersolution architects for software development, who will also be sensitive to societal concerns.

III. Mission:

- We aim to drive transformation, technology and innovation through problem solving approach andresearch development.
- We aim to provide students with the IT tools to become productive and lifelong learner.

IV. Aims:

- To impart quality computer education to enhance logical computing and programming skills.
- To implement innovative techniques and process in leading-learning and evaluation.
- To further creativity and pursuit of excellence in computer applications.

V. Learning Outcome Based Curriculum

Framework -1. Programme Education Objectives:

The Bachelor of Computer Application (Honors) Four Years degree programme has the following objectives…

I. To prepare the youth to take up positions as system analysts, system engineers, software engineers andprogrammers.
II. To aim at developing 'systems thinking' 'abstract thinking', 'skills to analyze and synthesize', and 'skillsto apply knowledge', through 'extensive problem solving sessions', 'hands on practice under various hardware/software environments' and' projects developed'.
III. To prepare students with 'social interaction skills', 'communication skills', 'life skills', 'entrepreneurial skills', and 'research skills' which are necessary for career growth and for leading quality life are also imparted.

2. Programmme Outcomes (POs) :

On completion of BCA (Honors) Four Year Degree Programme the expected programme outcomes that a studentshould be able to demonstrate are the following:

PO1. Computational Knowledge: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.

PO2. Problem Analysis: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.

PO3. Design / Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.

PO4. Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO5. Modern Tool Usage: Ability to select modern computing tools, skills and techniques necessary for innovative software solutions

PO6. Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.

PO7. Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.

PO8. Project Management: Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

PO9. Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.

PO10. Societal & Environmental Concern: Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.

PO11. Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment.

PO12. Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision and use ofinnovative ideas to create value and wealth for the betterment of the individual and society.

3. Programmme Specific Outcomes (PSOs) :

After the completion of the course, a student is able to

PSO1: Ability to learn the various programming languages with database concepts along with development environment

PSO2 : Ability to apply theoretical and practical knowledge to solve business problems through datacommunication technology concepts.

PSO3 : Flourish the innovation and research attitude to develop IT artifact.

PSO4: Foster analytical and critical thinking abilities for efficient programming

PSO5: Demonstrate and apply the programming knowledge to develop effective software solution.

PSO6: Enrich the knowledge in the areas of Advanced technologies and business practices.

PSO7: Maintain the personality with environmental and social concerns

4. Graduate Attributes:

After completing BCA (Honors) Four Year Degree programme the students will be able to acquire following attributesand skills to groom the overall personality.

GA01: Competence (strong foundational knowledge, skills and attitudes) in providing professional service

GA02: Ability to make decisions based upon critical thinking and reasoning

GA03: Readiness to identify, assess and respond to the needs of individuals, organizations and society

GA04: Talent and attitude to ethically conduct research

GA05: Service within the ethical, professional and legal framework

GA06: Readiness to lead and be led to provide service as a professional, as a researcher, as a manager, as an educator and as an advocate of best practices

GA07: Technology user in professional, educational and research work.

GA08: Sensitivity and commitment to environmental conservation and sustainability in the professional and personal spheres

GA09: Valuing the diversity of Indian culture, ethos and knowledge system

GA10: Self-directed and lifelong learner for continuous professional and personal development

GA11: Effective communicator while providing professional service

5. Duration of Program, Credit Requirements and Options:

The duration of BCA Three Year Degree Program having six semesters and BCA (Honors) Degree Program will be of four years spread across eight Semesters with multiple entry and exit options. Student should complete the 4 years degree programme within 7 years.

a) Following EXIT options are available with the students:

Exit Options	Minimum Credits Requirements	NCrF Level	Remark
Undergraduate Certificate in Business Administration – After successful completion of first year an additionally student have undergo a minimum 4 credit skill enhancement courses over and above the 40 credit earn for completing level 4.5	40	4.5	Students shall be allowed to join back in the 2nd year at level 5 before the expiry of the credits earned, subject to a maximum duration of seven years. The procedure for depositing and redemption of credits shall be as per the UGC (Establishment and Operation of Academic Bank of Credits in Higher Education) Regulations, 2021, as amended from time to time. ***[UGC (Minimum Standards of Instruction for the Grant of Undergraduate Degree and Postgraduate Degree) Regulations, 2025]***
UG Diploma in Business Administration- After successful completion of second year They have undergone a minimum 4-credit skill-enhancement course(s) over and above the 80 credits earned for completing level 5.	80	5	Students shall be allowed to join back in the 3rd year at level 5.5 at a later stage before the expiry of the credits earned, subject to a maximum duration of seven years. The procedure for depositing and redemption of credits shall be as per the UGC (Establishment and Operation of Academic Bank of Credits in Higher Education) Regulations, 2021, as amended from time to time.***[UGC (Minimum Standards of Instruction for the Grant of Undergraduate Degree and Postgraduate Degree) Regulations, 2025]***
Bachelor's Degree – After successful completion of Third year. Students who have earned a total of 120 credits by completing level 5.5 of NCrF and exit from	120	5.5	Students who have earned the required credits at level 5.5 of NCrF and exit from the undergraduate programme after 3 years

the undergraduate programme shall be awarded an undergraduate degree.			can resume the 4th year undergraduate (Honours/Honours with Research) programme at a later stage before the expiry of the credits earned, subject to a maximum duration of seven years. The procedure for depositing and redemption of credits shall be as per the UGC (Establishment and Operation of Academic Bank of Credits in Higher Education) Regulations, 2021, as amended from time to time. ***.[UGC (Minimum Standards of Instruction for the Grant of Undergraduate Degree and Postgraduate Degree) Regulations, 2025]***
Bachelor's Degree with Honors– After successful completion of fourth year Students who have earned the required credits at level 6 of NCrF shall be awarded an undergraduate (Honours/Honours with Research) degree.	160	6	
Bachelor's Degree with Research– After successful completion of fourth year. Students who have earned the required credits at level 6 of NCrF shall be awarded an undergraduate (Honours/Honours with Research) degree.			

Integration of Skill Courses and Apprenticeships. - A student has to earn a minimum of 50% of total credits in a discipline to earn an undergraduate degree with a major in that discipline. For the remaining 50% credits, the students may choose skill courses, apprenticeships and multidisciplinary subjects.

- Student with bachelor's degree can opt for bachelor's degree with Honors
- Student with bachelor's degree can opt for Bachelor degree with Honors (Research) if the student secure CGPA >= 7.5

VI. ,Academic Bank Of Credits (ABC) :

As per the National Educational Policy (NEP) 2020, the Academic Bank of Credit offer the flexibility of curriculum framework and interdisciplinary /multidisciplinary academic mobility of students across Higher Educational Institutes (HEIs) with appropriate credit transfer mechanism. In furtherance to these guidelines the Faculty of Management Studies, Bharati Vidyapeeth (Deemed to be University) Pune has designed a four years undergraduate program offered at its constituent units.

As a pre-requisite a student should register in the Bharati Vidyapeeth (Deemed to be University) Academic Bankof Credit. The credits earned by the student/learner will be stored in it. A Student/learner would be required to complete the course as per the ABC (Academic Bank Credit) policy of UGC. The validity of the credits earned for a course is seven years only.

VII. Eligibility Criteria for admission:

A candidate applying for BCA(Honors) Four years programme should have passed higher secondary (10 + 2) or equivalent examination (10+3) of any recognized Board with satisfying the conditions to pass a common All India Entrance test (BU-MAT) conducted by Bharati Vidyapeeth (Deemed to be University), Pune. The final admission is based solely on the merit at the BU-MAT test.

VIII. Grading System for Programmes under Management Studies:

- **Grade Points** : The Faculty of Management Studies, Bharati Vidyapeeth (Deemed to be University) has suggested 10-point grading system for all programmes designed by its various Board of Studies. A gradingsystem is a 10-point system if the maximum grade point is 10. The system is given in Table Ibelow.

Table I: The 10-point Grading System Adapted for Programmes under FMS

Range of Percent Marks	[80,100]	[70,79]	[60,69]	[55,59]	[50,54]	[40,49]	[00,39]
Grade Point	10.0	9.0	8.0	7.0	6.0	5.0	0.0
Grade	**O**	**A+**	**A**	**B+**	**B**	**C**	**D**

Formula to calculate GP is as under:

Set x = Max/10 where Max is the maximum marks assigned for the examination (i.e. 100)

Formula to calculate the individual evaluation

Range of Marks	Formula for the Grade Point
$8x \leq Marks \leq 10x$	10
$5.5x \leq Marks \leq 8x$	Truncate (M/x) +2
$4x \leq Marks \leq 5.5x$	Truncate (M/x) +1

- **Scheme of Examination**

Courses having Internal Assessment (IA) and University Examinations (UE)shall be evaluated by the respective constituent units and the University at the term end for **40** and **60** Marks respectively. The total marks of IA and UE shall be 100 Marks and it will be converted into grade points and grades.

For Internal Assessment (IA) the subject teacher may use the following assessment tools:

a) ***Attendance***
b) ***Class Tests***
c) ***Presentations***

d) Class Assignments

e) Case studies

f) Practical Assignments

g) Mini Projects

h) Oral

IX) MOOCs Policy:-

As per the guidelines provided by UGC each student have to complete TWO MOOCs (Massive Open Online Courses) as add on Course which provides wide access to the online learning. The student of regularprogramme should complete MOOCs prescribed by the institute in semester III, Sem IV, and / or Sem V.Each MOOC will be evaluated for TWO credits. The MOOC course fees should be borne by the respectivestudent. On successful completion of MOOCs course, the student should produce the completion certificate to the institute on the basis of which additional Credits will be given to the students.

- Following are the sources from where students can undertake MOOCs

1. iimb.ac.in
2. swayam.gov.in
3. edx.org
4. Coursera
5. harvardx.harvard.edu
6. Indira Gandhi National Open University (IGNOU)
7. National Council of Educational Research and Training (NCERT)
8. National Institute of Open Schooling (NIOS)
9. National Programme on Technology Enhanced Learning (NPTEL)
10. Any other sources offering online courses suggested by institute

X. Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn theassigned credits, the student/learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If Student fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks inIA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculatedonly if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Headof Passing. Similarly, a student who fails in a course at IA he has to reappear only at IA as backlog candidate andclear the Head of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks<80	A+	9
60≤Marks<70	A	8
55≤Marks<60	B+	7
50≤Marks<55	B	6
40≤Marks<50	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course.The weightsfor performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are convertedto grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that “Max” is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set x = Max/10 (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and theCumulative GradePoint Average (CGPA) shall be computed at the end of each term. The SGPAmeasures the cumulative performanceof a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in allthe courses since his/her enrolment. The CGPA of learner when he /she completes the programme is the final resultof the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum Ck * GPk}{\sum Ck}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\Sigma C_k * GP_k}{\Sigma C_k}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the studyfrom the time of his/her enrolment and also during the semester for which CGPA is calculated.

The CGPA shall be calculated up to two decimal place accuracy.

The formula to compute equivalent percentage marks for specified CGPA:

% marks (CGPA)	10 * CGPA-10	If 5.00 ≤ CGPA < 6.00
	5 * CGPA+20	If 6.00 ≤ CGPA < 8.00
	10 * CGPA-20	If 8.00 ≤ CGPA < 9.00
	20 * CGPA-110	If 9.00 ≤ CGPA < 9.50
	40 * CGPA-300	If 9.50 ≤ CGPA ≤ 10.00

XI. Award of Grades:

A student who has completed the minimum credits specified for the programme shall be declared to have passed inthe programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studiedand passed. The criteria for the award of grades are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.5≤CGPA ≤10	O	Outstanding	80≤Marks≤100
9.0≤CGPA ≤9.49	A+	Excellent	70≤Marks<80
8.0≤CGPA ≤8.99	A	Very Good	60≤Marks<70
7.0≤CGPA ≤7.99	B+	Good	55≤Marks<60
6.0≤CGPA ≤6.99	B	Average	50≤Marks<55
5.0≤CGPA ≤5.99	C	Satisfactory	40≤Marks<50
CGPA below 5.0	F	Fail	Marks below 40

XII. Rules of ATKT:

The Academic Council at its 72nd meeting held on 25-2-2025 has resolved to REPEAL the condition related to the number of heads of passing required by the students to proceed to next year or subsequent years / semesters. In view of this, the students admitted can be permitted to take admission in the subsequent years / semesters irrespective of the number of subjects they have passed /cleared. However, the University reserves its right to admit the students in any of the semester / year depending on the fulfillment of level of knowledge required. These conditions are not applicable to programmes which are governed and have to abide by Council regulations. This will be effective from the Summer 2025 examinations and onwards.

[Refer Notification 1304 of University]

XIII. INTERNSHIP :

At the end of Semester VI, each student shall undertake Internship in an Industry for 50 (Fifty Days). It is mandatory for the students to seek written approval from the Faculty Guide about the Topic & the Organization before commencingthe Internship.

During the Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or telecom. Internship Project should be a Computer Application to Real life business activity.

The learning outcomes and the utility to the organization must be highlighted in Internship Project Report.

General chapterization of the report shall be as under:

1) Introduction
2) Theoretical background
3) Company profile
4) Objectives of the study
5) System Requirements
6) System Analysis & Design
7) Implementation & Testing
8) Conclusion &

Suggestions

References:

Annexure:

TECHNICAL DETAILS:

1. The report shall be printed on A-4 size white bond paper.
2. 12 pt. Times New Roman font shall be used with 1.5 line spacing for typing the report.
3. 1" margin shall be left from all the sides.
4. Considering the environmental issues, students are encouraged to print on both sides of the paper.
5. The report shall be hard bound as per the standard format of the cover page given by the Institute and shall begolden embossed.
6. The report should include a Certificate (on company's letter head) from the company duly signed by thecompetent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Director of the Institute 10 (Ten) days before theviva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copyin the institute. The other copy of the report is to be kept by the student for their record and future references.
9. In addition to this, students should prepare two soft copies of their Summer IP reports & submit one each inTraining & Placement Department of the Institute & Library

The Internship(804) shall be assessed out of 200 Marks. The breakup of these marks is as under; Viva- voce examination = 120 (One Hundred Twenty) Marks

Internship Report = + 80 (Eighty) Marks

200 (Two Hundred) Marks

The examiners' panel shall be decided as per the guidelines received from the University.

The viva –voce shall evaluate the project based on

i. Actual work done by the student in the organization
ii. Student's knowledge about the company & Business Environment
iii. Learning outcomes for the student
iv. Utility of the study to the organization

XIV. A) Project (community Based/Software based)

The project work would expose students to the socio-economic issues in society so that the theoretical learnings can besupplemented by actual life experiences to generate solutions to real-life problems.

As a part of Sem-VII (703), each student shall undertake Community based project related the areas of community engagement and service, environmental education, and value-based education.

It is mandatory for the students to seek written approval from the Faculty Guide about the Topic before commencing theproject work. The topic may relate survey based or software based problem. The learning outcomes and the utility to the society must be highlighted in Project Report.

B) Guidelines to conduct Practical examination for courses 206, 406, 605

Schedule the practical examination of said courses in one day, dedicating two hrs for a batch to solve the practical questions/problems which will be evaluated for 50 marks and conduct the project viva for 50 marks, The same team of examiners (internal+external) will work for both. Thus it will be combined passing for single head

XV. Specializations:

BCA three year degree programme and BCA(Hons.) four year degree programme 2022 offers specialization to the students/learners in the third year of both the programmes. The students/learner are required to select any one specialization from the list provided below.

Sr. No.	Specialization Course	Course No	Course Name
01	**Data Analysis**	504-1-A	Data analysis using Excel
		604-1-B	R Programming
02	**Information Security**	504-2-A	Information Security Concepts
		604-2-B	Information Security Administration
03	**Data Science**	504-3-A	Statistical Programming Using R
		604-3-B	Introduction to Data Science
04	**Information Systems**	504-4-A	E-Commerce
		604-4-B	Knowledge Management
05	**Block Chain**	504-5-A	Blockchain Technology and Platforms
		604-5-B	Blockchain Platforms and Ecosystems

06	**AI/ML**	504-6-A	Theory of Artificial Intelligence
		604-6-B	Theory of Machine Learning
07	**Distributed Computing And Network**	504-7-A	Advanced Computer Network
		604-7-B	Distributed Computing

Prerequisite for offering the specialization –

- There must be minimum 10 (Ten) students for a particular specialization.

XVI. Course Structure:

SEMESTER I

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
101	Fundamentals of Information Technology	DSC	3	3	1	-	40	60	100
102	C Programming	DSC	3	3	1	-	40	60	100
103	Organization of IT Business	MDC	3	3	1	-	40	60	100
104	Discrete Mathematics	MDC	3	3	1	-	40	60	100
105	Lab on MS-Office Suite	DSC	2	-	-	4	40	60	100
106	Lab on C Programming	DSC	2	-	-	4	40	60	100
107	Human Universal Values	VBC	2	2	-		50	-	50
108	Language – I	AEC	2	2	-	-	50	-	50
Total			**20**	**16**	**4**	**8**	**340**	**360**	**700**

SEMESTER II

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
201	Web Development Technology	DSC	3	3	1	-	40	60	100
202	DBMS I	DSC	3	3	1	-	40	60	100
203	Data Structures using C	DSC	3	3	1	-	40	60	100
204	Financial Accounting	MDC	3	3	1	-	40	60	100
205	Lab on Data Structures using C	DSC	2	-	-	4	40	60	100
206	Lab on Web Development Technology	DSC	2			4	40	60	100
207	Environmental Studies	VBC	4	2	-	2	40	60	100
Total			**20**	**14**	**4**	**10**	**280**	**420**	**700**

SEMESTER III

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
301	Operating Systems	DSC	3	3	1	-	40	60	100
302	Software Engineering	DSC	3	3	1	-	40	60	100
303	Java Programming	DSC	3	3	1	-	40	60	100
304	Statistics	MDC	3	3	1	-	40	60	100
305	Lab on Oracle	DSC	2	-	-	4	40	60	100
306	Lab on Java	DSC	2	-	-	4	40	60	100
307	Start-up Management	AEC	2	2	-	-	50	-	50
308	Yoga & Meditation	VBC	2	2	-	-	50	-	50
Total			**20**	**16**	**4**	**8**	**340**	**360**	**700**

The student should complete TWO MOOCs (Massive Open Online Courses) as add on Course which provides wide access to the online learning. The student will complete MOOCs prescribed by the institute in semester III, Sem IV, and / or Sem V. Additional Credits will be given to the student as per MOOCs Policy

SEMESTER IV

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
401	Computer Networks	DSC	3	3	1	-	40	60	100
402	Advanced JAVA	DSC	3	3	1	-	40	60	100
403	Advanced HTML with Javascript and CSS	DSC	3	3	1	-	40	60	100
404	Optimization Techniques	MDC	3	3	1	-	40	60	100
405	Lab on Advanced JAVA	DSC	2	-	-	4	40	60	100
406	Lab on HTML, Javascript and CSS & Minor Project - I	DSC	2	-	-	4	40	60	100
407	Cyber security	SEC	2	2	-	-	50	-	50
408	Mathematical Aptitude	AEC	2	2	-	-	50	-	50
Total			**20**	**16**	**4**	**8**	**340**	**360**	**700**

SEMESTER V

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
501	Basic Python Programming	DSC	3	3	1	-	40	60	100
502	Dot Net programming using C#	DSC	3	3	1	-	40	60	100
503	Entrepreneurship Development	MDC	3	3	1	-	40	60	100
504	Elective I	DSE	3	3	1	-	40	60	100
505	Lab on Python	DSC	2	-	-	4	40	60	100
506	Lab on Dot Net and C#	DSC	2	-	-	4	40	60	100
507	IT based Aptitude	AEC	2	2	-	-	50	-	50
508	Human Rights	Multi DC	2	2	-	-	50	-	50
Total			**20**	**16**	**4**	**8**	**340**	**360**	**700**

SEMESTER VI

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	**T**	**P**			
601	Data warehousing and Data Mining	DSC	3	3	1	-	40	60	100
602	Web Programming (PHP)	DSC	3	3	1	-	40	60	100
603	Software Project Management	DSC	3	3	1	-	40	60	100
604	Elective II	DSE	3	3	1	-	40	60	100
605	Lab on Web programming with Project	DSC	2	-	-	4	40	60	100
606	Lab on Data Visualization	DSC	2	-	-	4	40	60	100
607	Digital marketing	SEC	2	2	-	-	50	-	50
608	Indian Culture	VBC	2	2	-	-	50	-	50
Total			**20**	**16**	**4**	**8**	**340**	**360**	**700**

Fourth year of BCA Honors Programme

SEMESTER VII

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
701	Introduction to AI and ML	DSC	3	3	1	-	40	60	100
702	Object Oriented Analysis and Design	DSC	3	3	1	-	40	60	100
703	Research Methodology	MDC	3	3	-	-	40	60	100
704	Project (Community based/Software based)	DSC	4	-	1	4	60	90	150
705	Mobile Application Development with Lab	DSC	4	2	1	4	60	90	150
706	Organizational Behavior	Multi DC	2	2	-	-	50	-	50
707	Technical Writing	SEC	1	2	-	-	50	-	50
Total			**20**	**15**	**4**	**8**	**340**	**360**	**700**

SEMESTER VIII

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
801	Cloud Computing	DSC	3	3	1	-	40	60	100
802	Enterprise Resource Planning	DSC	3	3	1	-	40	60	100
803	Block Chain Technology	DSC	3	3	1	-	40	60	100
804	Professional Ethics	Multi DC	3	3	1	-	40	60	100
805	Internship Project	Intern ship	5	-	-	8	80	120	200
806	Research Publication	DSC	2	-	-	2	50	-	50
807	Intellectual Property Rights	AEC	1	2	-	-	50	-	50
Total			**20**	14	4	10	**340**	**360**	**700**

Fourth year of BCA Honors Programme with Research

SEMESTER VII

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
701	Introduction to AI and ML	DSC	3	3	1	-	40	60	100
702	Object Oriented Analysis and Design	DSC	3	3	1	-	40	60	100
703	Research Methodology	MDC	3	3	-	-	40	60	100
704	Project (Community based/Software based)	DSC	4	-	-	4	60	90	150
705	Mobile Application Development with Lab	DSC	4	2	1	4	60	90	150
706	Research Publication-I	DSC	2	-	-	-	50	-	50
707	Technical Writing	SEC	1	2	-	-	50	-	50
Total			**20**	**13**	**3**	**8**	**340**	**360**	**700**

SEMESTER VIII

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
801	Dissertation	DSC	15	-	-	15	200	300	500
802	Seminar on Literature Review based on Recent Trends In IT	DSC	3	-	-	3	100	-	100
803	Research Publication-II	DSC	2	-	-	2	100	-	100
Total			**20**	**-**	**-**	20	**400**	**300**	**700**

Abbreviations Expanded

- **DSC** - Discipline Specific Course
- **DSE** - Discipline Specific Elective
- **MDC** – Minor Disciplinary Course
- **MultiDC**- Multidisciplinary Course
- **SEC** - Skill Enhancement Course
- **VBC** - Value Based Course
- **AEC** - Ability Enhancement Course

XVII. Summary of the Syllabus Content

Sr. No	Syllabus Content	Remark (If Any)
1	**Total credit** **BCA Honors (160 Credits)** **BCA Honors with Research (160 credits)** Credit structure in all semester as per AICTENorms	
2	**Total Marks of Subjects-** Marks & Credit distributed • Sem I= 700 (20) • Sem-II- 700 (20) • Sem-III-700(20) • Sem-IV-700 (20) • Sem-V-700(20) • Sem-VI-700(20) Sem-VII(Honors)-700(20) Sem-VII(Honors with Research)-700(20) Sem-VIII(Honors)-700(20) Sem-VIII(Honors with Research)-700(20) • Three Year BCA Degree-4200(120) • Four Year BCA Honors Degree -5600(160) • Four Year BCA Honors with Research Degree -5600(160)	
3.	**Introduced MOOCS** Mandatory to complete TWO MOOCs in Sem-III,Sem-IV and / or Sem-V, each will be evaluated for 2 credits Total = 4 credits	MOOCS becomes Mandatory as per UGC and AICTE Norms.
4.	**Total specialization options (7)** • Data Analysis • Information Security • Data Science • Information System • Block Chain • Artifitial Intelligence –Machine Learning • Distributed Computing and Network	
5	Two courses of category VBC/AEC/SEC are added in each semester from Sem-I to Sem-VI. These are introduced newly to enhance the student abilities and values	
6	Examination Pattern UE- 60 MARKS (3 hours duration) IE – 40 marks Ratio of UE:IE is 60:40 Total = 100 marks Evaluation Pattern for Environmental Studies as below	

	30 IE - Seminar/ assignment/ class test/project 10 IE - Attendance 40 UE - MCQ based university exam 20 UE - field work/Case studies Total 100 marks	

XIX. Question Paper Patterns for University Examination:

The pattern of question paper for the courses having University Examinations (**Regular mode**) will be as follows :

Title of the Course

Day: **Total Marks: 60**

Date: **Time: 03 Hours**

Instructions:

1. Section I **Question No 1** is **Compulsory** based on MCQ. Each question carries 01 marks
2. Attempt any **FIVE** questions from Section II. Each question carries 08 Marks.
3. Attempt any **ONE** from Section III. Each question carries 10 marks

SECTION – I			
		CO (CO number to be mentioned: Refer Syllabus)	BL (Bloom's Taxonomy Level to be mentioned viz. Create (1); Evaluate (2); Analyze (3); Apply (4); Understand(5); Remember (6)
Q 1. Includes 10 objective type sub questions covering all units of course, each sub question carries 1 mark. (Each question should be mapped with the CO & BL)	(10 marks)	Each objective questions to be mapped with CO & BL	
SECTION – II			
It should contain 6 questions covering the syllabus. Questions should be set uniformly from all the units.		CO (CO number to be mentioned: Refer Syllabus)	BL
Question	Marks	CO	BL
Q.2 ……	(8 marks)		
Q.3 ……	(8 marks)		
Q.4 ……	(8 marks)		
Q.5……	(8 marks)		
Q.6……	(8 marks)		

Q.7 Write Short Notes on ANY TWO a. b. c.	(8 marks)		
SECTION – III			
This section should be based on case-study, problem solving and would carry 10 marks. Questions in this section should be designed to evaluate the higher levels of Bloom's Taxonomy viz. Create, Evaluate, Analyze, Apply.		CO	BL
Q.8……..	(10 marks)		
Q.9……	(10 marks)		

Note:

1. Answer book for the Section I will be separate and student should return this answer book within firsthalf an hour.
2. Answers to Section II and III should be written in the SAME ANSWER BOOK.
3. The question paper should be relevant to the set of course outcome.
4. Question Papers shall be prepared to incorporate varying levels of difficulty such as:
   i. Must know – Vital (60% weightage)
   ii. Should know – Essential (20% weightage)
   iii. Could know – Desirable (20% weightage)
5. The length of the question-reasonably feasible for an average student to answer with in the stipulatedtime.

As Per AICTE –Module – New Course Structure BCA (H) CBCS -2022- 2023

Major Highlights

1. **Credit and Marks Structure**

   - ✓ I Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ II Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ III Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ IV Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ **Total =160 Credit**
   - ✓ Total Marks- 5600 (I to VIII (H) Sem)
   - ✓ Structure – UE+IE, IA, (Open) and MOOCS

2. **Offering New Specialization -**
   Introduce New Additional Specialization & Develop Syllabus Structure = Three (3)
   - ✓ Block Chain
   - ✓ Artifitial Intelligence –Machine Learning
   - ✓ Distributed Computing and Network

3. **Developed New Open subject Syllabus content = Twelve (12)**
   - ✓ Human Universal Values
   - ✓ Language – I
   - ✓ Environmental Studies
   - ✓ Community Work (SwacchaBharat Abhiyan)
   - ✓ Start-up Management
   - ✓ Yoga & Meditation
   - ✓ Cyber security
   - ✓ Mathematical Aptitude
   - ✓ IT based Aptitude
   - ✓ Human Rights
   - ✓ Digital marketing
   - ✓ Indian Culture

4. **Introduction of MOOCS from Semester III Onwards- Compulsory (TWO)**

5. **Examination pattern - 100 Marks (60-UE + 40-IE)**
   - ✓ Examination HOURS 3 Hrs

6. **Total No of Subjects offering (8 Semester) = 57**

As Per AICTE –Module – New Course Structure BCA (R) CBCS -2022- 2023

Major Highlights

1. **Credit and Marks Structure**

   - ✓ I Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ II Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ III Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ IV Year - 40 Credits (20 Credit + 20 Credit)
   - ✓ **Total =160 Credit**
   - ✓ Total Marks- 5600 (I to VIII (R) Sem)
   - ✓ Structure – UE+IE, IA, (Open) and MOOCS

2. **Offering New Specialization -**
   Introduce New Additional Specialization & Develop Syllabus Structure = Three (3)
   - ✓ Block Chain
   - ✓ Artifitial Intelligence –Machine Learning
   - ✓ Distributed Computing and Network

3. **Developed New Open subject Syllabus content = Twelve(12)**
   - ✓ Human Universal values
   - ✓ Language – I
   - ✓ Environmental Studies
   - ✓ Community Work (Swaccha Bharat Abhiyan)
   - ✓ Start-up Management
   - ✓ Yoga & Meditation
   - ✓ Cyber security
   - ✓ Mathematical Aptitude
   - ✓ IT based Aptitude
   - ✓ Human Rights
   - ✓ Digital marketing
   - ✓ Indian Culture

4. **Introduction of MOOCS from Semester III Onwards- Compulsory (TWO)**

5. **Examination pattern - 100 Marks (60-UE + 40-IE)**
   - ✓ Examination HOURS 3 Hrs

6. **Total No of Subjects offering (8 Semester) = 57**

Dr. Pallavi
Jamsandekar
Chairperson
Board of Studies

Computer Applications and System Studies

Programme: BCA-CBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
I	**101**	**Fundamental of Information Technology**	
	Prepared by	**Dr. Bhaskar V. Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

- The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics.

Course Outcomes:

After completing the course the students shall be able to

CO1: Understand basic concepts and types of Computers, memory devices and software.
CO2: Remember types of computers and its peripherals
CO3: Demonstrating MS-office tools for data processing, mathematical operations in worksheets, presentations.
CO4: Analyse the use of various components of computer

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	Computer-Definition, Characteristics, Block Diagram of computer, number system, Concept ofHardware, Software, Evolutionof computer and Generations Types of Computers – Analog and Digital computers, Hybrid Computers, GeneralPurpose and Special Purpose Computer Limitations of Computer, Applications of Computer in Various Fields.	9	CO1	As per individual faculty discretion	Remember	As per individual faculty discretion
2	• Input Device – Keyboard, Mouse, Scanner, MICR, OMR. Output Devices – VDU, Printers – Dot Matrix, Daisywheel, Inkjet, Laser, Line Printers and	8	CO1, CO2	As per individual faculty discretion	Understand	As per individual faculty discretion

	Plotters.					
3	• Memory Concept, Memory Cell, Memory Organisation, Semiconductor Memory – RAM, ROM, PROM, EPROM Secondary Storage Devices – Magnetic Tape, Magnetic Disk (Floppy Disk and Hard Disk.), Compact Disk.	8	CO2	As per individual faculty discretion	Analyze	As per individual faculty discretion
4	• Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. • Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w. Concept of Network and its Type, Basic Elements of a Communication System, Data Transmission Media, Topologies	8	CO4	As per individual faculty discretion	Create	As per individual faculty discretion
5	• **MS Office:** Introduction to MS Office, Components and Features. • **MS Word:** Creating Letter, Table, Fonts, Page Layout Document, Formatting, Spell Check, Print Preview, Template, Color, Mail Merge, Auto Text, Inserting Picture, Word Art. • **MS Excel:** Introduction to Excel, Sorting, Queries, Graphs, Scientific Functions. • **PowerPoint:** Introductio n to PowerPoint, Creation of Slides, Inserting Pictures, Preparing Slide Show with Animation. **MS Access:** Creation and Manipulation of Files.	12	CO3	As per individual faculty discretion	Create	As per individual faculty discretion

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Dromey	How to solve computer	2015,3rd edition	PHI Publication
2	P. K. Sinha	Computer Fundamentals	12thedition	PBP Publication
3	V. Rajaraman	Computer Fundamentals	6TH EDN. 2014	PHI Publication

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www. edx.com
2	www.coursera.com

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**CourseTitle**	
I	**102**	**C Programming**	
	Prepared by	**Dr. A.R.Mujawar**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSC	**3**	UE(60)+IE(40)	100

Course Objectives:

Objectives :

- To learn Procedure Oriented Programming Language C.
- Emphasise on process of learning a computer language.
- Focus on semantics and problem solving.

Course Outcomes:

After completing the course the students shall be able to

CO1: To understand problem solving approach using procedural technique.
CO2: To understand the basics of C Programming.
CO3: To understand various statements, operators in C.
CO4: To develop various C program using constructs in C language.

Unit	Content	Sessions	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
Introduction to Algorithm	• Concept, of Problem, Procedure andAlgorithm • Algorithm Representation throughPseudo -Code and Flow - Charts • Tracing of Algorithms Such as Swapping, Counting, Finding the Sum, Product, maximum, minimum,of a list of numbers.	5	CO1	Lecture	Understand	Quiz Short Answers
Introduction to CLanguage	• History • Structure of C Programming, Function as building blocks	5	CO2	Lectures with PPTs	Understand	Quiz Short Answers

	• Language Fundamentals, Character set, C Tokens, Keywords, Identifiers, Variables, Constant, • Data Types, Comments					
Operators	• Types of operators, Operator Precedence and Associativity • Expression, Statement and types of statements • Built in Operators and functions • Console based I/O and related built in I/O function- printf(), scanf(), getch(), getchar(), putchar(), • Concept of header files, Preprocessor directives - #include, #define	6	CO3	Lectures with PPTs	Understand	Quiz Short Answers
Control Structures	• Basic Control Structures • Decision making structures - if statement, if-else statement, Nested if-else statement, switch statement • Loop Control structures - while loop, do-while loop, for loop, Nested for loop • Other statements - break keyword, continue keyword, goto keyword, exit function	8	CO4	Lectures with PPTs	Create	Quiz Short Answers
Functions and Arrays	• Introduction • Purpose of function, Function declaration/ Function prototype, Function definition,Function call, return statement • Function parameters • Types of functions • Call by value • Storage classes • Recursion, Examples on recursive function • Introduction to one-	13	CO4	Lectures with PPTs	Create	Quiz Short Answers

	dimensional Array, Definition, Declaration, Initialization, Accessing and displaying array elements • Arrays and functions • Introduction to two-dimensional Array, Definition, Declaration, Initialization, Accessing and displaying array elements					
Strings, Structure andPointers	Introductions to Strings, Definition, Declaration, Initialization Input, output statements for strings Standard String library functionswith example Structure – User defined data types, Concept of structure,Union; Member access operator Introduction to pointer, Definition,Declaring and Initializing pointer variable Indirection operator and address ofoperator, Accessing variable through its pointer, Pointer arithmetic Dynamic memory allocation	8	CO4	Lectures with PPTs	Create	Quiz Short Answers

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Yashwant Kanetkar	Let us C	2018	BPBPublications
2	B.W.Kernighan, D.M.Ritchie	The'C'programming language	1998	PHI
3	Balaguruswami	Programming inANSIC	2019	TMH

Online Resources:

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/cprogramming
2	https://www.javatpoint.com/c-programming-language-tutorial
3	https://www.w3schools.in/c

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
I	**103**	**Organization of IT Business**	
	Prepared by	**Dr.Mukund Kulkarni**	
Type	**Credits**	**Evaluation**	**Marks**
MDC	3	UE:IE	60:40

Course Objectives:

To acquaint students with fundamentals of Business Organization and management systems as a body of knowledge.

Course Outcomes :

CO1: To know about business and its structure and its various forms.
CO2: To Apply and enlighten with nature and scope of IT business organization.
CO3: To make them understand the office function and its significance on office Layout.
CO4: To understand the complexities associated with management of human resources in the IT organizations and integrate the learning in handling these complexities.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Nature and Evolution of Business-** Concept of Business – Meaning, Definition, Nature and Scope, Characteristics of Business. Business as an Economic Activity. Objectives of Business. Structure of Business (Classification of Business Activities. Requisites for Success in ModernBusiness. Beginning and development of Commerce, Evolution of Industry, Industrial Revolution, Beginning	10	CO 1	As per individual faculty discretion	Understand	As per individual faculty discretion

	and growth of Indian Business, Industrialization in India					
2	**Forms of Business Ownership-** Introduction to various forms, features Merits and Demerits of Sole Proprietorship – Joint Hindu FamilyBusiness – Partnership – Joint Stock Company – Co-operative Organization, Public Enterprises, limited liability partnership; distinction between types of private & public company; Factors affecting choices of an deal form of ownership.	10	CO 1 & CO 2	As per individual faculty discretion	Apply (Analyse)	As per individual faculty discretion
3	**Formation of a Company-**Formation of a Company-Stages in formation and incorporation of a company (Promotion – incorporation and registration – Capital Subscription, Commencement of Business; Documents of a Company i.e. Memorandum of Association – Articles of Association; Prospectus)	10	CO 2	As per individual faculty discretion	Apply	As per individual faculty discretion
4	The Impact of information technology on the Business- The Impact of information technology on the Business- Modern Organizations, Creating New Types of Organization, Automation of Business Processes, Data-Driven Decision Making, Customer Experience & Marketing (CRM, Digital Marketing Technologies), Cybersecurity in Business Environments, Data governance, New Business Models Enabled by IT	10	CO2 & CO3	As per individual faculty discretion	Evaluate	As per individual faculty discretion

	(Freemium, subscription, on-demand, SaaS/PaaS/IaaS), Disintermediation & Reintermediation (How IT alters value chains (e.g., Amazon vs traditional retail))					

5	**Strategic Issues of Information Technology-** Strategic Issues of Information Technology- IT and Corporate Strategy- Some examples of Technology strategy (value chain, A framework for the strategic use of IT), Creating and sustaining a Competitive edge (Using resource to advantage, protecting an IT innovation), Integrating Technology with the Business Environment, Emerging technologies: cloud, AI, IoT, blockchain & their disruptive potential, Change management, digital agility, sustainability (Green IT)	5	CO4	As per individua lfaculty discretion	Analyse	As per individual faculty discretion

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	S.A. Sherlekar	Modern BusinessOrganization and Management	latest edition	Himalaya Publishing House)
2	Y.K. Bhushan	Fundamental ofBusiness Organization &Managemen	latest edition	S Chand Publishers
3	C. R. Basu	Business Organization and Management	1998	Tata McGraw Hill
4	Lucas Henry C.Jr	Information Technology for Management	latest edition	Tata McGraw Hill
5	S.S. Dubey	IT Services Business Management: Concepts, Processes and Practices	latest edition	PHI Publication

Online Resources

Online Resources No.	Web site address
1	NPTEL
2	Swayam
3	www.edx.com
4	www.coursera.com

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
I	**104**	**Discrete Mathematics**	
	Prepared By	**Dr. D.V.Sahasrabuddhe**	
Type	**Credits**	**Evaluation**	**Marks**
MDC	3	UE(60)+IE(40)	100

Course Objectives:

Get familiar with discrete structures of mathematics and its application in Business.

- Model the given data in set structure also Set relation among data descriptors.
- Define the function and identify the types of function
- Represent the facts in logic statements and resolve the given problem

Course Outcomes :

CO1: To understand discrete structures like sets, matrix, relations etc.(Understand)
CO2 : To solve problems by carrying out various operations on structures (Apply)
CO3 : To apply proper structure for representing given data (Apply)
CO4 : To construct logic circuits for given Boolean expression (CreElecate)
CO5 : To test truthiness of the statement (Analyse)

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Set Theory** Definition of a set, Representation of elements of sets, Methods of representing sets, types of sets, operations on sets , cardinality of a set, Principle of Inclusion and Exclusion, Venn Diagram, Proof by using Venn diagram	8	CO 1, CO 2, CO 3	Lecture, problem solution, Quiz	Understand, Apply	Short Answers, Problem Solving Skills
2	**Functions and Relations** Definition of Function, Types of Functions ,Composite Function, Relation definition, representation of relations, Graphics of relations, properties of relations: injective, surjective and bijective functions,	8	CO 1, CO 2, CO 3	Lecture, problem solution, Quiz	Understand, Apply	Short Answers, Problem Solving Skills

	compositions.					
3	**Logic**	9	CO 1, CO 2,	Lecture,	Understand,	Short

	Propositions, Logic Operations-Negation, Disjunction, Conjunction, Conditional and Biconditional, Truth Tables of compound propositions, Translating English sentences in to logical statements and vice versa, Logic gates and circuits		CO 4, CO 5	problem solution, Quiz	Apply, Analyze, Create	Answers, Problem Solving Skills
4	**Matrices** Matrix Definition, General Form, Representation of matrix in computers, Types of matrices, Operations on matrices: Addition, Subtraction and Multiplication, transpose , row / column transformations , Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices	10	CO1, CO 2, CO 3	Lecture, problem solution, Quiz	Understand, Apply	Short Answers, Problem Solving Skills
5	**Permutations, Combinations and Probability** Concept- Permutation, Combination, Sum and Product rules, problems on Permutation and combination (with wording atleast, atmost, neither nor, any one etc.) Concept and problem solving, general probability, conditional probability, partitions, Bayes Theorem	10	CO1, CO 2, CO 3	Lecture, problem solution, Quiz	Understand, Apply	Short Answers, Problem Solving Skills

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Kenneth Rosen	Discrete Mathematics & its Applications, 6th Edition	2007	Tata Mc Graw Hill
2	Semyour Lipschutz & Marc Lipson	Discrete Mathematics, 2nd Edition	Reprint 2010	Tata Mc Graw Hill

MOOCs:

Resources No.	Web site address
1	NPTEL Swayam
2	www.coursera.com
3	www. edx.com

Programme: BCA – CBCS – Revised Syllabus w.e.f.- Year2022–2023			
Semester	**Course Code**	**Course Title**	
I	**105**	**Lab on MS-Office Suite**	
	Prepared by	**Dr.Bhaskar Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	UE:IE	60:40

Course Objectives:

- The objective of this course is to help the student gain proficiency in text editing and formatting, spreadsheet and database management, and presentation preparation. An additional objective of the course is for the student to gain basic knowledge of modern-day computing technology.

Course Outcomes:

CO1: Students are able to prepare documentation using MS-Word
CO2: Demonstrate an advanced knowledge of the Word Processing package to design & create effective and structured documents like technical reports, letters, brochures, etc.,
CO3: Demonstrate the skills in the appropriate use of various features of the spread sheet package MS Excel to create useful spreadsheet applications like tabulated statements, balance sheets, statistical charts, business statements, etc.
CO4: Demonstrate the skills in making an effective presentation with audio and video effects using them. MS Power Point

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	Verify the components of a typical computer system, Explore, maintain files, andcustomize the Windows operating system, Review using the Internet Explorer.	4	CO1	As per individual faculty discretion	Remember	As per individual faculty discretion
2	Introduction to MS Word, Menus, Shortcuts, Document types Working with Documents: • Opening Files, formatting page and Setting Margins, converting files to different formats, Editing text documents, Using Toolbars, Ruler, Icons and help • Formatting Documents: Setting Font Styles, Setting Paragraph style, Setting Page Style, Setting Document Styles	8	CO1, CO2	As per individual faculty discretion	Understand	As per individual faculty discretion

	• Creating Tables: Table settings, Borders, Alignments, insertion, deletion, Merging, Splitting, Sorting, Formula • Drawing: Inserting Pictures/Files etc., Drawing Pictures, Formatting &Editing pictures,Grouping and ordering, Rotating Tools: Word Completion, Spell Checks, Macros, Mail merge, Templates, Using Wizards, Tracking, Changes, Security					
3	○ Introduction: Opening new Presentation, Different presentation templates, setting backgrounds, Selecting presentation layouts ○ Creating a presentation: Setting presentation style, Adding Text to the presentation ○ Formatting a presentation: Adding style, Color,gradient fills, arranging objects, Adding Header & Footer, Slide background, Slide layout ○ Adding Graphics to the presentation: Inserting pictures, movies, tables, etc into the presentation, Drawing Picturesusing Draw Adding effects to the presentation: Setting Animation & transition effect, Adding audio and videoPrinting Handouts and Generating standalone presentation viewer	6	CO3 & CO4	As per individual faculty discretion	Analyze	As per individual faculty discretion
4	○ Introduction: Spreadsheet & its applications, opening spreadsheet, Menus & Toolbars & icons, Shortcuts, Using help ○ Working with Spreadsheets:	4	CO3	As per individual faculty discretion	Create	As per individual faculty discretion

	Opening a File, Saving Files, Setting Margins, converting files to different formats: Importing, Exporting and Sending files to others, Spreadsheet addressing, Entering and Editing Data: o Computing data: Setting Formula, finding total in a column or row, Mathematical Operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formula. o Formatting Spreadsheets: Formatting – Cell, row, column Headers, Row Height, Column Width, Visibility – Row, Column, Sheet, worksheet Security o Formatting – worksheet: Sheet Formatting & style - background, color, Borders & shading, Anchoring objects, Formatting layout for Graphics, Clipart etc., o Working with sheets : Sorting, Filtering, Validation, Consolidation, Subtotal , Creating Charts, selecting charts, Formatting charts, label, scaling etc., o Using Tools: Error Checking, Spell Checks, Macros, Formula Auditing, Creating & using Templates, Tracking changes, customization, printing worksheet					
5	• Concept of Functions, commonly used functions: Sum, Max, Min, Average, Count,Today, Now, dated if, Count if, CountA, Count Blank, Round, Roundup, Round Down, ABS, Sign,	8	CO3	As per individual faculty discretion	Create	As per individual faculty discretion

	Ceiling, Floor, Trim, Value, Clean, sqrt, if, sum if **MS Access:** What is an Access Database, opening a Database File, Create Table, Create and modify fields of tables, construct simple queries, Saving and Running Queries					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1 International	Dromey	How to solve computer	2015,3rd edition	PHI Publication
2 National	P. K. Sinha	Computer Fundamentals	12thedition	PBP Publication
3 National	V. Rajaraman	Computer Fundamentals	6TH EDN. 2014	PHI Publication

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www.bretlsimmons.com
2	https://www.youtube.com/watch?v=JIa7vP3gyL4
3	www.positivesharing.com
4	https://www.youtube.com/watch?v=r2Xv9Am7PWQ

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme: BCA CBCS – Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
I	**106**	**Lab on C Programming**	
	Prepared By	**Dr.Ayesha Mujawar**	
Course Type	**Credits**	**Evaluation**	**Marks**
DSC	2	UE(60)+IE(40)	100

Course Objectives :

- To make students practice on the procedure oriented programming using C
- To train the students for programming logic development

Course Outcomes:

CO1: To develop skills to write simple programming concepts using C language.

CO2: To develop an application using Decision making and looping And Make use of proper operators to solve the problem.

CO3: To apply efficient use of functions and storage classes.

CO4: To apply use of Arrays and pointers efficiently and handling strings.

CO5: To understand the dynamic memory allocation and pointers in C. Able to define new data types using enum, structures and typedef.

Unit	Content	Sessions	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Operators	Compilation and Executing programs Arithmetic operations Use of Symbolic constants Demonstrating the following gcc options -o, -c, -D, -l, -I, -g, -E Programs to demonstrate use of operators and Input/ output ***gcc or an equivalent compiler is assumed***. Compilation and Executing programs Arithmetic operations	5	CO1	Live Demo	Understand	Quiz

Selection &Iteration Construct	Program to demonstrate the following - Branching - Nested Branching - Looping Selection.	7	CO2	Live Demo	Create	Quiz
Function and Storage Classes	Working with functions – Writing function prototype and definition – Using functions to solve problems (Calling a function) – Using recursion Storage classes - Using register, extern and static	6	CO3	Live Demo	Create	Quiz
Arrays and Strings	Arrays and Strings 1D - Linear Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort 2 D - Matrix operations Strings: program to do operations on string using library and user defined functions Finding length of string, String concatenation, removing extra spaces, get substring, check whether second string is part of another, converting string to lowercase, uppercase etc..	7	CO4	Live Demo	Create	Quiz
Structures & Pointers	Structures Making use of structures to define new types(user defined types) Arrays of structure, display all elements of array and sorting of them. Pointers, Programs to demonstrate working of pointer; need of pointer, Pointer as parameter to function Comparison of pointer with arrays and using pointer to refer an arrayCreating pointer dynamically by using dynamic memory allocation Array of Pointers, Ragged Arrays, Function pointer. real-world problem-solving by developing student record systems, billing applications, and calculators	5	CO5	Live Demo	Create	Quiz

Reference Books

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	YashwantKanetkar	Let us C	2018	BPBPublications
2	B.W.Kernighan, D.M.Ritchie	The'C'programming language	1998	PHI
3	Balaguruswami	Programming inANSIC	2019	TMH

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/cprogramming
2	https://www.javatpoint.com/c-programming-language-tutorial
3	https://www.w3schools.in/c

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
I	**107**	**Universal Human Values**	
	Prepared by	**Dr.Deepali Gala**	
Type	**Credits**	**Evaluation**	**Marks**
VBC	2	IA	50

Course Objectives:

- To help the student to see the need for developing a holistic perspective of life.
- To sensitize the student about the scope of life – individual, family, society and
- nature/existence.
- Strengthening self-reflection.
- To develop more confidence and commitment to understand, learn and act accordingly

Course Outcomes :

CO1: Provide an overview of Prerequisites to Human Values

CO2: Understand the role of a human being in ensuring harmony in self and society

CO3: Analyze ethical dilemma while discharging duties in professional life.

CO4: Evaluate ethical and unethical decisions and take a right stand

CO5: Develop a harmonious environment for holistic development of self and body.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	Evaluation Tools
1	1. Value Education, Definition, Concept and Need for Value Education. 2. Values Types and their Importance in Human Life 3. Self exploration as a means of Value Education,.	3	CO 1	As per individual faculty discretion	Remember	As per individual faculty discretion
2	1. Human Being is morethan just the Body. 2. Harmony of the Self ('I')with the Body - happiness and physical facility 3. Understanding Myself asCo-existence of the Self and the Body. 4. Understanding Needs of the Self and the needs of the Body. Understanding the activities in the Self and the activitiesin the Body.	7	CO2, CO5	As per individual faculty discretion	Understand	As per individual faculty discretion
3	1.Family as a basic unit of Human Interaction and Values in Relationships. 2.The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude, Prosperity and Love. 3.Comprehensive Human Goal: The Five Dimensions of Human	10	CO 3	Lecture with PPTs Case Study	Analyse	As per individual faculty discretion

	Endeavour. 4. Harmony in Nature: The Four Orders in Nature. 5. The Holistic Perception of Harmony in Existence.					
4	1. Value based Life and Profession. 2. Professional Ethics and Right Understanding. 3. Competence in Professional Ethics. 4. Issues in Professional Ethics – The Current Scenario. 5. Principles of Professional Ethics Computers and information Ethics Cyber crimes and Cyber security Difference between Ethical and unethical conduct, Awareness of Dangers of Drug Abuse	8	CO4	As per individual faculty discretion	Create	As per individual faculty discretion

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Bertrand Russell	Human Society in Ethics & Politics	2015	Taylor and Francis
2	I.C. Sharma	Ethical Philosophy of India	1965	Johnsen

Online Resources

Online Resources No.	Web site address
1	https://fdp-si.aicte-india.org/verifiedProgramDetailsList.php

2	https://citizenchoice.in/course/Universal-Human-Values/Unit%201/Happiness-and-Prosperity

MOOCs:

Resources No.	Web site address
1	Swayam.gov.in
2	https://epgp.inflibnet.ac.in/

Programme:BCA CBCS – Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
I	**108**	**Language-I**	
	Prepared by	**Dr. Amarja Nargunde**	
Type of Course	**Credits**	**Evaluation**	**Marks**
AEC	2	IE (50)	50

Course Objectives :

To make students to:

1. Participate actively in discussions & debates
2. Give impromptu speeches and prepared presentations
3. Read, comprehend and summarize articles
4. Learn typical formats for writing and practice writing skills
5. Prepare power-point presentations
6. Receive extensive feedback on their oral and written skills

Course Outcomes:

After completing the course the students shall be able to

CO1: Understand and read English better

CO2: Write accurately and speak fluently.

CO3: Participate actively in discussions and debates

CO4: Give presentations.

Unit	Content	Sessions	CO Number	Teaching Methodology	Cognition Level	Evaluation Tools

1	Construction of sentences with there is, there are, itis etc. Usage of articles, tenses and prepositions etc. Translation of sentences, & passages from mother tongue to English General errors in Sentence Constructions Synonyms, Antonymous, useof appropriate words Idioms & Phrases	6	CO1, CO2	Lectures, Videos	Understand and Apply	Quizzes

2	Reading short passages aloud anddiscussion Listening of conversations and answering questions Comprehension of Short Passages Comprehensions oftexts, judgments and other passages of more general nature	6	CO2	Practical- Reading by Students	Understand and Evaluate	Class Exercises Evaluation
3	Introducing oneself Conversations between two student on a given topic/role play Impromptu speechon a given topics Debates and Logical reasoning	6	CO2, CO3	Practical- Role Play, speeches and debates	Create	Class Exercises Evaluation
4	Writing correctly (Grammar, Punctuation) Paragraph Writing Letters – Structure & Layout (Business& Official letters) Essay writing Resume writing	6	CO2	Lecture and practical writing exercise	Create	Long Assignments
5	Preparing PowerPoint presentations Preparing for class-room presentations	6	CO4	Lectures and students giving actual presentations	Create	PPT making and Presentation evaluation

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	B.M. Sheridan	Speaking and Writing in English	2017	The Readers Paradise
2	Ellen Kaye	Maximize Your Presentation Skills: How to Speak, Look, and Act on Your Way to the Top	2002	Currency
3	Thomson and Martinet	A practical English Grammar	1970	The English Language Book Society and Oxford University Press
4	Wren and Martin,	English Grammar and Composition	latest edition	S. Chand, Delhi
5	Mike Gould	Cambridge Grammar and Writing Skills Learner's Book 8	2019	Cambridge University Press

Online Resources:

Online Resources No.	Web site address
1	https://www.passporttoenglish.com
2	https://www.youtube.com/user/EnglishLessons4U
3	http://www.5minuteenglish.com/grammar.htm
4	https://learnenglish.britishcouncil.org/skills/writing/a1-writing
5	https://www.skillsyouneed.com/presentation-skills.html

MOOCs:

Resources.	Web site address
1	https://www.my-mooc.com/en/mooc/english-grammar-style-uqx-write101x-3/
2	https://www.my-mooc.com/en/mooc/business-english-making-presentations/
3	https://www.my-mooc.com/en/mooc/english-for-effective-business-speaking/
4	https://www.my-mooc.com/en/mooc/english-for-business-and-entrepreneurship/
5	https://www.my-mooc.com/en/mooc/english-doing-business-asia-writing-hkustx-eba102x-1/

Semester	Course Code	Course Title	
II	**201**	**Web Development Technology**	
	Prepared by	**Dr.Suvarna Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

To make students to:

- To get proficiency in Website designing
- To learn Wordpress as Content Management System
- To get familiar to use all setting and components of Wordpress

Course Outcomes :

CO1:To understand Wordpress as a Content Management System
CO2 :To understand Hosting,Website layout, Admin Panel
CO3: To understand use of Themes and Templates, PlugIn in Wordpress
CO4:To apply Themes and Templates, PlugIn in Web Page to create Website

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	Evaluation Tools
1	Elements of website - Domain ,Hosting , Content Management System (Wordpress), Domain – Registration , Manage DNS , Nameserver and Domain Forward Hosting – Understand the Difference in Shared Hosting , Cloud Hosting and VPS Hosting	9	CO 1	Lecture with Ppts	Understand	Quiz Short Answers

	WordPress - Installation of WordPress , MySQL Secuirty Certificate – Understand the use of SSL using Free and Paid Service Providers					
2	**Website Configuration** Header and Footer Configuration General Configuration – Font / Forecolor / Button Type / Backcolor Site Configuration – Logo , Site Icon , Site Name Home page Setting , Website layout Setting	9	CO 2	Lecture with Ppts	Understand	Quiz Short Answers
3	**Admin Panel Understanding** Change Settings- General Writing Reading, Discussion , media, permalinks and privacy Import and Export website data Add / modify Themes Install – Activate Plugin	9	CO2	Lecture with PPTs	Understand	Quiz Short Answers
4	**WordPress Themes** And **Working with Content** Basics of Themes, Downloading, installing, and activating themes, Installing themes from Dashboard WordPress Plugin: Basics of Plugin, Downloading, installing, and activating free and Paid Plugin WordPress Templates: Basics of Templates, Downloading, installing, and activating Templates,	10	CO3	Lectures with PPTs	Understand	Quiz Short Answers

	Design Pages using Template Posts Vs Pages, Adding Hyperlinks, Playing with Media content, Previewing and Editing Posts, Previewing and Editing Pages, Page Order, Creating a post, Adding Media files to content –images and videos, Using Categories and Tags, Creating Pages, Page Hierarchy					
5	**Case Study –Online Sales Website** Design Page using Elementor plugin Demonstrate the use of WooCommerce plugin Add WhatsApp Chat button to website for communication Integrate Shipping solution to website using (shiprocket / instashipin) plugin Integrate Payment gateway to website using (payu / razorpay) plugin	8	CO4	Lecture	Create	Quiz Short Answers

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Lisa Sabin - Wilson	Wordpress Web Design for Dummies	2015	For Dummies
2	Lisa Sabin- Wilson	Wordpress All in One for Dummies	2017	John Wiley & Sons
3	Sayyed Majid	Wordpress Web Development:Basic to Advance	2021	Code Academy, Aurangabad
4	Joseph Joyner	Wordpress For Beginners: How to Create and Set Up Your Own Website or Blog Using Wordpress	2015	Mihails Konoplovs
5	Dr. Ritesh Kumar	Learn WordPress in Easy Way	2019	Ganpati Book Centre

Online Resources

Online Resources No.	Web site address
1	https://www.tutorialspoint.com/wordpress
2	https://www.javatpoint.com/wordpress-tutorial
3	https://www.w3schools.in/wordpress

MOOCs:

Resources No.	Web site address
1	NPTEL
2	Swayam
3	edx.com
4	coursera.com

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
II	**202**	**DBMS - I**	
	Prepared by	**Dr. Ayesha Mujawar**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IE(40) + UA(60)	100

Course Objectives:

To make students to:

- Get familiar with basic concepts of DBMS.
- To impart knowledge of the concepts related to database and operations on databases.
- To manage database in various environments with emphasis on security measures and concurrency.

Course Outcomes:

After completing the course the students shall be able to

CO1: To understand the basic concepts in database management system.
CO2: To design the database by applying data model like Entity relational model.
CO3: To apply the keys and normalization technique while designing the database.
CO4: To understand and apply various SQL Components.
CO5: To understand the concept of transaction and its operations.

Unit	Sub Unit	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Introduction Of Database Management System	Basic Concepts of DBMS (Data Vs. Information), Data Processing, DefinitionofDBMS, Characteristic of Database **Databasearchitecture:** Levels of Abstraction, Databaseschema and instances 3tierarchitecture of DBMSData Independence,Database users,Types of Database System	8	CO1	Lecture with Ppt	Understand	Quiz Short Answers
Data Modeling	**Logical Data Modeling:** Hierarchical Data Model, Network Data Model, Relational Data Model. **ConceptualData Modeling:** Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, MappingCardinalities, ER Diagram Notations **Roles Participation**: Total and Partial, Strong and Weak Entity Set. Design ER Diagrams for a real-world database system (e.g., Library Management, Inventory Control, Online Booking).	8	CO2	Lecture with Ppt	Apply (Analyse)	Case Study
Normalization	Codd's Rules for RDBMS **Keys:** Primary key, Foreign key, Candidate key, Super key, Unique key. Simple Key, Composite key Normalization:Concept of normalization, Decomposition,Lossy andLossless Decomposition, Functional Dependencies. Normal	11	CO3	Lecture with Ppt	Apply	Quiz Short answers

	Form: First NF, Second NF, Third NF, Case Studies on Normalization					
Introduction to Database Languages and Basic concepts of SQL	Database Languages: Introduction of SQL, features, SQL data types. DDL commands: create table, describe table, alter table, and drop table commands. DML Commands: insert, delete, update command DQL commands: All select commands, and order by clause.	8	CO4	Lecture with ppt	Create	Quiz
Transaction management and Concurrency control	Transaction management: Definition of transaction, State of Transaction, ACID properties, Schedules, Serializability of schedules Concurrency control: Lock based concurrency control (2PL), Strict 2PL, Time stamping method. Deadlock and its handling: Definition, Wait-Die and Wound- Wait methods. Database Recovery: Log Based Recovery, Check points, Shadow Paging	10	CO5	Lectures with PPTs	Understand	Quiz Short Answer

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Ramez Elmasri, S.Navathe	Fundamentals of Database Systems	6th Edition 2010	Pearson Education
2	A Silberschatz, H Korth, S Sudarshan	Database System and Concepts	6th Edition 2010	McGraw-Hill.
3	C.J.Date	An Introduction to Database Systems	3rd Edition 2006	Addison Wesley

Online Resources:

Online Resources No.	Website address
1	https://www.javatpoint.com/dbms-tutorial
2	https://www.tutorialspoint.com/dbms
3	https://www.w3schools.in/dbms

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
II	**203**	**Data Structures using C**	
	Prepared by	**Mr. B. D. Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IE&UA	40+60

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.
- To understand file handling in C.

Course Outcomes:

After completing the course the students shall be able to

CO1: Learn the basic types for data structure, implementation and application.
CO2: Know the strength and weakness of different data structures.
CO3: Use the appropriate data structure in context of solution of given problem..
CO4: Develop programming skills which require solving given problem.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Data Structure -** • Data type and data object • Abstract Data Type (ADT) • Type of data structure • Applications of data structures in real life • Array as a data structure • Sorting techniques with time complexity: Bubble sort, Selection sort, Insertion sort and Quick sort • Searching techniques with time complexity: Linear search and	10	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers

	Binary search					
2	**Linked List -** • Definition and Memory representation of linked list • Types of Linked List- singly, doubly and circular • Basic Operations of linked list • Applications of linked list	10	CO 2	Lecture with Ppts Case Study Applications	Apply (Analyse)	Case Study , Business cases End Term: Applied Questions
3	**Stack and Queue** **Stack:** • Definition • Stack operations • Array implementation of stack • Linked list implementation of stack • Applications of stack **Queue:** • Definition • Queue operations • Array implementation of queue • Linked list implementation of queue • Applications of queue	12	CO 3	Lecture with PPTs Case Study Applications	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Tree** • Concept of tree • Tree terminologies • Binary Tree • Types of binary tree • Types of traversal- Preorder, Inorder and Postorder	7	CO 3	Lectures with PPTs Video Cases	Evaluate	Group Activity End Term Exam: Short business cases and situation based questions
5	**File Handling** • Concept of file • Types of File	6	CO 4	Lecture with ppt Case study on real life	Analyze / Evaluate	Case Presentation Activity End Term:

	• Operations on file • File modes • file management functions-fopen(), fclose(),fprintf (), fscanf(), getc(), putc (), getw(), putw () • Random access functions-fseek(), ftell() and rewind()			applications Activity		Theory Applied Questions

Reference Books

Sr.No.	Name of the Author	Title ofthe Book	Year Edition	Publisher Company
1	Yashavant Kanetkar	Data Structures Through C	2009 Second	BPB Publications
2	Reema Thareja	Programming in c	2011 First	Oxford University Press
3	Aaron Tenanbaum	Data Structures using C and C++	Second Edition	Pearson Education

Online Resources:

Online Resources No.	Website address
1	https://www.mygreatlearning.com/blog/data-structures-using-c/
2	https://www.edureka.co/blog/c-data-structures/
3	https://www.programiz.com/dsa
4	https://www.javatpoint.com/data-structure-tutorial

MOOCs:

ResourcesNo.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme : BCA CBCS– RevisedSyllabusw.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
II	**204**	**Financial Accounting**	
	Prepared by	**Dr.A.B.Nadaf**	
Type	**Credits**	**Evaluation**	**Marks**
MDC	3	IE (40) + UA(60)	100

Course Objectives:

- To get familiar with basics of accounting concepts.
- To learn journal entries and prepare financial statements
- To get acquainted with computerised accounting system

Course Outcomes:

After completing the course, the students shall be able to

CO1 : Remember the basic numerical operations and pass book entries.

CO2 :Understand the basics of financial accounting and accounting principles

CO3 : Apply the rules of journal entries for preparing journals, ledgers and trial balance.

CO4 : Analyse the trial balance and transferring the accounts to respective financial statements.

CO5 :Evaluate the adjustments and applying its effect on respective accounts.

Unit	Content	Sessios (Hrs)	COsNo	Teaching Methodology	Cognition Level	Evaluation Tools
1	Need for Accounting, Meaning and definition of book keeping, Systemof Book keeping. Financial Accounting- definition, Scope and objectives, Financial Accounting v/s Book Keeping, Limitations ofFinancial Accounting. End users of financial statements. Accounting principles- Accounting Concepts and Conventions , , Branches of accounting ,concept of bad debts , depreciation ,methods ofdepreciation :Fixed and reducing, Examples on depreciation	10	CO1 CO2	Classroom Lectures	Understand	Attentiveness of the students, End Term Exams
2	Journal-importance and utility, classification of accounts, journalizing of transactions. Ledger- meaning and utility, postingof journal entries to the ledgers ,closing the ledger accounts, Examples on journal entries of transactions and posting them to ledgers, closing ledger accounts	10	CO2	Lecture Method	Understand and Apply with the simple case study	Case Study Discussion , Class Test' End Term Class Assignment
3	Simple Cash book, CashBook with two columns, Cashbook withthree columns, Petty Cash Book , Purchase book, Sales book, Purchase Return book , Sales return book . TrialBalance - meaning and purpose, Preparation of Trial Balance from ledger accounts	09	CO3	Lecture Method	Understand and Apply	Case Study, Question and Answer, End Term
4	Meaning of final account, Need to preparefinal account , Uses of Final account , Preparation of Final account of Sole Proprietorship : Tradingand Profit, Loss Accountand Balance Sheet of sole proprietary businesswith given adjustments	09	CO4	Lecture Method	Understand and Apply	Case Study, End Term
5	Need of accounting software, features of accounting packages , introduction to Tally package, various books maintained in Tally accounting package, atomized effect of one transaction in various books of accounting through accounting package.	07	CO5	Lecture Method	Understand	End Term

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Dr. S. N. Maheshwari	Financial Accounting For Management	2012	Vikas Publishing House
2	Robert Anthony, David Hawkins	Business Accounting	2009	Tata McGraw–Hill
3	M.G.Patkar	Book-Keeping & Accountancy	2006	FYJC Commerce
4	Anil Chowdhary	Fundamentals of Accounting & Financial Analysis	2007	Pearson Education

MOOC's:

Sr.No.	Website address
1	https://in.coursera.org/courses?query=accounting

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
II	**205**	**Lab on Data Structures using C**	
	Prepared by	**Mr.B.D.Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	IE&UA	40 + 60

Course Objectives:

- To write and execute programs in C to solve problems using data structures such as arrays, linked list, stack, queues and trees.
- To learn to write C programs to implement various sorting and searching algorithms.
- To understand the basics of file handling and to write C programs to implement different file management functions.

Course Outcomes:

CO1: Able to identify the appropriate data structures for solving real world problems.
CO2: Able to implement various kinds of searching and sorting techniques.
CO3: Able to implement data structures such as arrays, linked list, stack, queues and trees to solve various computing problems.
CO4: Able to implement different file management functions.

Unit	Content	Sessions (Hrs	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Introduction to Data Structure -**Write C programs for the following operations on Array. (i) Creation (ii) insertion (iii)deletion (iv) traversal Write C programs for implementing the following searching techniques. 1) Linear search 2) Binary search Write C programs for implementing the following sorting techniques to arrange alist of integers in ascending order. 1) Bubble sort 2)Insertion sort 3)Selection sort	7	CO 1	Lab Demo ,Quiz	Understand	Quiz End Term Internals : Short Answers

2	**Linked List -** Write a C program for the following operations on Singly Linked List. 1) Creation 2) insertion 3) deletion 4) traversal 5) Searching Write a C program to count number of items present in a singly linked list. Write a C program for the following operations on Doubly Linked List. 1) Creation 2) insertion 3) deletion 4) traversal 5) Searching	7	CO 2	Lab Demo ,Quiz, Case study	Apply (Analyse)	Case Study ,Business cases End Term: Applied Questions
3	**Stack and Queue** Write a C program to implement stack using array. Write a C program to implement stack using linked list. Write a C program that convert infix expression into postfix form. Write a C program to convert decimal to binary using stack. Write a C program to check whether a string is a Palindrome or not using stack.	7	CO 3	Lab Demo ,Quiz, Case study	Analyse	Case Study with Presentation sEnd Term Exams: Case based Questions/Applied Questions

	Write a C program to convert an infix expressioninto prefix format. Write a C program to implement queue using array. Write a C program to implement queue using linked list.					
4	**Tree** Write C program to demonstrate concept of tree. Write a C program to count number of leaf nodes and total number of nodes in a tree.	4	CO 3	Lab Demo , Quiz, Case study	Evaluate	Group Activit y End Term Exam: Short business cases and situation based questions
5	**File Handling** Write C programs to implement working of following file management functions: fprintf (), fscanf(), getc(), putc (), getw(), putw () Write C programs to implement working of following Random access functions: fseek(), ftell() and rewind() Write a C program to display contents of a file inuppercase and lowercase letters. Write a C program to count characters, spaces, tabs and new lines in a file. Write a C program to copy the contents of one file to another file. Write a C program to receive strings from keyboard and write them toa file. Write a program to readstrings from a file and display them on screen	5	CO 4	Lab Demo , Quiz, Case study	Analyz e / Evaluat e	Case Presentatio nActivity End Term: Theory Applied Questions

Reference Books

Sr.No.	Name of the Author	Title ofthe Book	Year Edition	Publisher Company
1	Yashavant Kanetkar	Data Structures Through C	2009 Second	BPB Publications
2	Reema Thareja	Programming in c	2011 First	Oxford University Press
3	Aaron Tenanbaum	Data Structures using C and C++	Second Edition	Pearson Education

OnlineResources:

Online Resources No.	Website address
1	https://www.mygreatlearning.com/blog/data-structures-using-c/
2	https://www.edureka.co/blog/c-data-structures/
3	https://www.programiz.com/dsa
4	https://www.javatpoint.com/data-structure-tutorial

MOOCs:

ResourcesNo.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
II	**206**	**Web Development Technology**	
	Prepared by	**Dr.Suvarna Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	UE:IE	60:40

Course Objectives:

To make students to:

- To get proficiency in Website designing
- To learn Wordpress as Content Management System
- To get familiar to use all setting and components of Wordpress

Course Outcomes :

CO1: To demonstrate Hosting,Website layout, Admin Panel, Header, footer
CO2 : To demonstrate general setting and use of Themes and Templates, PlugIn in Wordpress
CO3: To create Website with Themes and Templates, PlugIn

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	Domain Hosting Content Management System (Wordpress), Domain – Registration ,Manage DNS , Nameserver WordPress - Installation of WordPress	4	CO 1	Practical Demo	Create	Quiz
2	Header and Footer Configuration General Configuration –Site Configuration – Logo , Site Icon , Site Name Home page Setting , Website layout Setting	5	CO 2	Practical Demo	Apply	Quiz
3	General Writing Reading ,Discussion , media, permalinks and privacydata Themes Activate Plugin	5	CO2	Practical Demo	Create	Quiz
4	Themes, Downloading, installing, and activating themes, WordPress Plugin: Downloading, installing, and activating,Templates Downloading, installing, and activating Templates, Design	6	CO3	Practical Demo	Create	Quiz

	Pagesusing Template Adding Hyperlinks, Playing with Media content, Previewing and Editing Pages,Page Order, Creating a post, Adding Media files to content					
5	Demonstrate the use of WooCommerce plugin Add WhatsApp Chat buttonto website for communication Integrate Shipping solutionto website Integrate Payment gateway to website	10	CO3	Practical Demo	Create	Quiz

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Lisa Sabin - Wilson	Wordpress Web Design forDummies	2015	For Dummies
2	Lisa Sabin- Wilson	Wordpress All in One forDummies	2017	John Wiley & Sons
3	Sayyed Majid	Wordpress Web Development:Basic to Advance	2021	Code Academy, Aurangabad
4	Joseph Joyner	Wordpress For Beginners: Howto Create and Set Up Your OwnWebsite or Blog Using Wordpress	2015	Mihails Konoplovs
5	Dr. Ritesh Kumar	Learn WordPress in Easy Way	2019	Ganpati BookCentre

Online Resources

Online Resources No.	Web site address
1	https://www.tutorialspoint.com/wordpress
2	https://www.javatpoint.com/wordpress-tutorial
3	https://www.w3schools.in/wordpress

MOOC:

ResourcesNo.	Web site address
1	NPTEL
2	Swayam
3	edx.com
4	coursera.com

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year2024 –2025			
Semester	**Course Code**	**Course Title**	
I	**207**	**Environmental Studies**	
	Prepared by	**Ms. Nilofer Amin**	
Type	**Credits**	**Evaluation**	**Marks**
VBC	4	IE(40) UE(60)	100

Course Objectives:

- To Understand the nature and function of the natural environment
- To cater students from diverse disciplinary backgrounds and to sensitize them about the commitment of our nation towards achieving sustainable development goals and addressing global environmental challenges.

Course Outcomes:

After completing the course the students shall be able to

CO1: Understand the importance of Environment in the life of living things.
CO2: Apply the awareness knowledge in taking eco-friendly decisions in society.
CO3: Judge what is right and wrong for the environment in day to day life.
CO4: Analyze the impact of different human activities on environment and its effect.
CO5: Understand the need and way of sustainable development and will pass the knowledge to the next generation.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Humans and the Environment	The man-environment interaction Environmental Ethics and emergence of environmentalism	4	CO1	Class Teaching	Understanding	Class Test
Natural Resources and Sustainable Development	Overview of natural resources, Biotic resources, Water resources, Soil and mineral resources, Energy resources	6	CO4, CO5	Class Teaching	Understanding	Class Test
Environmental Issues: Local, Regional and Global	Environmental issues and scales, Pollution, Land use and Land cover change , Global change	6	CO3	Class Teaching	Understanding	Class Test
Conservation of Biodiversi	Biodiversity and its distribution, Ecosystems and ecosystem services, Threats to biodiversity	6	CO2	Class Teaching	Understanding	Class Test

ty and Ecosystems	and ecosystems, Major conservation policies					
Environmental Pollution and Health	Understanding pollution:, Air pollution, Water pollution:, Soil pollution and solid waste, Noise pollution, Thermal and Radioactive pollution	6	CO3, CO4	Class Teaching	Understanding	Class Test
Climate Change: Impacts, Adaptation and Mitigation	Understanding climate change, Impacts, vulnerability and adaptation to climate change, Mitigation of climate change	6	CO1, CO3, CO4	Class Teaching	Understanding	Class Test
Environmental Management	Introduction to environmental laws and regulation, Environmental management system Concept of Circular Economy, Life cycle analysis;Cost-benefit analysis, Environmental audit and impact assessment	6	CO2, CO5	Class Teaching	Analyse	Quiz and Case Study
Environmental Treaties and Legislation	An overview of instruments of international cooperation Major International Environmental Agreements Major Indian Environmental Legislations: Major International organisations and initiatives	6	CO1, CO3, CO5	Class Teaching	Analyse	Quiz and Case Study
Case Studies and Field Work	Discussion on one national and one international case study related to the environment and sustainable development. Field visits to identify local/regional environmental issue Participation in plantation drive and nature camps Documentation of campus biodiversity.	30	CO3, CO4, CO5	Field Work and Project	Apply	Project

	Campus environmental management activities					

Assessment pattern as below(Total marks=100)

30 IE - seminar/ assignment/ class test/project
10 IE - Attendance
40 UE -MCQ based university exam
20 UE - field work/Case studies

References Books:

Sr. No	Name of the Author	Title of the Book	Publisher Company
1	Bharucha Erach	The Biodiversity of India	Mapin Publishing Pvt. Ltd.
2	Agrawal K.C	Environmental Biology	Nidhi Publishers Ltd(2001)
3	Jadhav H and Bhosale V.M.	Environmental Protection and Laws	Himalaya Publishing House.
4	Miller T.G. Jr.	Environmental Science	Wadsworth Publishing Co.
5	Jackson, A. R., & Jackson, J. M. (2000).	Environmental Science: The Natural Environment and Human Impact.	Pearson Education
6	William P. Cunningham and Mary A	Cunningham Environmental Science: A global concern,	Mc-Graw Hill, USA

MOOC

Resource No.	Website Address
1	NPTEL
2	Swayam
3	edx.com
4	coursera.com

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**Course Title**	
III	**301**	**Operating Systems**	
	Prepared by	**Dr. Prashant Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IE(40) + UA(60)	100

Course Objectives:

To make students to:

- To acquire knowledge regarding structure and working ofthe major operating system components
- To learn and apply different process and memory scheduling algorithms and synchronization techniques to achieve better performance of computer system.
- To understand structure and organisation of file system.

Course Outcomes:

After completing the course the students shall be able to

CO1: Understand functioning and working of Operating System
CO2: Explain the concepts of process scheduling, memory and file management
CO3: Understand I/O System

Unit	Content	Session (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to operating System** Definition and concept of OS, History of OS, Importance and function of Operating system. Types of OS -Batch System, timesharing, Multitasking, Multiprogramming, multi-processing, online operating system, real time, distributed operating system. Views-command language users view, system call users view, structure of OS- simple, monolithic system and layered system, client server model. User operating - system interface: command line interface, GUI, Kernels, Types of Kernels (Monolithic/ MacroKernel and Micro/ Exo Kernel, Virtual Machines, Shell	7	CO1	Lecture with PPTs Quiz	Understand	End Term Internals: Short Answers
2	**Process Management** - Processconcept, Process Control Block OS services for Process management, scheduling and typesof schedulers,	10	CO2	Lecture with PPTs Video	Understand & Evaluate	End Term Internals: Short Answers

	scheduling algorithm- First come first					

	served,shortest job first, shortest remaining time next, time slicescheduling, priority-based scheduling, multilevel queue, multilevel queue with feedback					
3	**Storage Management -** Basic concept of storage management, logical and physical address space, swapping, contiguous allocation, non-Contiguous allocation , fragmentation, segmentation, paging, demand paging ,virtual memory, page replacement algorithms- FIFO, Optimal page replacement algorithm, least recently page replacement algorithm, clock page replacement algorithm, design issue of paging, thrashing.	10	CO2	Lecture with PPTs Video	Understand & Evaluate	Assignments End Term Internals: Short Answers
4	**Inter-process communication and synchronization -** Need, Mutual Exclusion, Semaphore, Busy-wait Implementation, characteristics of semaphore, queuing implementation of semaphore, producer consumer problem, critical region and conditional critical area. What is deadlock? Conditions to occur the deadlock, deadlock prevention, deadlock avoidance- banker‘s algorithm. Resource request, resource release.	8	CO2	Lecture with PPTs Quiz	Analyze	Classroom test End Term Internals: Short Answers
5	**File Systems andI/O System :** **File System** : Files-basic concept, file attributes, operations, file types, file structure, accessmethods, Directory- structure- single level directory system, two level directory system, hierarchical directory system, directory operations, protection,security, allocation method. **Input/output System:** Principles of I/O hardware, I/O devices, device controller, DMA, Principles of I/O software-goals, interrupt handler, device driver. Mass storage structure-disk structure,disk scheduling (FCFS, SSTF,SCAN, LOOK, C- SCAN, C-LOOK)	10	CO3	Lecture with PPTs Case Studies	Understand & Apply	Quiz End Term Internals: Short Answers

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Silber Schatz, Galvin,Gagne	Operating System Concepts	11th Edition	Wiley Publication
2	Milan Milinkovic	Operating Systems Concept and Design	2nd Edition	McGraw Hill Education India
3	Andrew Tanenbaum and Albert Woodhull	Operating Systems Design and Implementation	3rd Edition	Pearson

Online Resources:

Online Resources No.	Website address
1	https://www.studytonight.com/operating-system/
2	https://www.tutorialspoint.com/operating_system/index.htm
3	https://www.youtube.com/watch?v=WJ-UaAaumNA
4	https://www.youtube.com/watch?v=zFnrUVqtiOY

MOOCs:

Resources No.	Website address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Semester	Course Code	CourseTitle	
III	**302**	**Software engineering**	
	Prepared by	**Dr. Smita Gambhire**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IA(40) + UE(60)	100

Course Objectives:

To make students to:

- To make students familiar with basic concepts of Software Engineering.
- To introduce the methodologies involved in the development and maintenance of Software overits entire life cycle.

Course Outcomes:

After completing the course, the students shall be able to

CO1: Understand life cycle models**,** Requirement elicitation techniques, understand theconcept of Analysis and Design of software.

CO2: Develop SRS as per any of the existing standards.

CO3: Implement software engineering concepts in software development to develop quality software..

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1.	**1.Introduction toSoftware Engineering:**Softwar e, Program vs Software,software charac teristics, Definition of Softw areEngineering, importance, principles of softwareengineering,Difference betweensoftware engineering andsoftwareprogramming, Members involved in software development.	8	CO1,CO3	Lecture with Ppts, Discussion	Understand	Discussion
2.	**2. Software processand Feasibility study:** Need of Feasibility study,types of Feasibility study, Cost Benefit Analysis. General softwaredevelopmentlife cyclewith all phases.Overview of softwaremodels (Waterfall, Prototyping, and Spiral and Rapid Application Development model, Agile model)	8	CO1, CO2, CO3	Lecture with Ppts, Practical sessions on computer	Understand and calculate	Understand and calculate cost of project
3.	**3. Requirement Engineering Concepts and Methods** : What isRequirement Engineering, Types ofrequirements, Requirement elicitation techniques-Traditional methodsandModern methods, Verification and validation process. Principles of Requirement Specification,	11	CO1,CO3	Lecture with PPTs, Case Studies	Understand and data gathering	Analyze and apply enginee ring steps for it.

	Software Requirement Specification document Outline Characteristicsof good SRS: - correct, complete, unambiguous, consistent, modifiable, traceable, Understandable					
4.	**Analysis and Design Tools**: Entity-Relationship Diagrams, Decision Tree and Decision Table, Data Flow Diagrams(DFD),Data Dictionary,Elements of DD Advantage of DD, Pseudocode, Input and Output Design **Structured System Design:** Modules Concepts and Types of Modules Structured Chart ,Qualities of Good Design , Coupling, Types of Coupling , Cohesion, Types of Cohesion, CASE STUDIES (Based on Above Topic)	8	CO3	Lectures with PPTs, and Case Studies	Evaluate	Formulate and practice the case studies on various topics
5.	**Software Testing, Quality Control andSoftware Maintenance** :Definition, Test characteristics,Typesof testing: Black-BoxTesting, White- Box Testing, Unit testing,	10	CO3	Lectures with PPTs,	Design Quality Control mechanis m	Use quality control and maintena nce mechani sm

	Integration testing **Quality concept:** Quality, SQA Plan, Software Configuration Management Formal Technical review: Review meeting, review reporting and review guidelines Software Configuration Process. software maintenance					

ReferenceBooks:

Sr.No.	NameoftheAuthor	Title ofthe Book	Year	PublisherCompany
1	Roger S. Pressman	SOFTWARE ENGINEERING A PRACTITIONERS APPROACH	seventh edition	McGraw Hill International Edition
2	Sommerville	Software Engineering	seventh edition	Pearson Education
3	K.K. Aggarwal & Yogesh Singh	Software Engineering	-	New Age International

Online Resources:

OnlineResourcesNo.	Websiteaddress
1	https://www.youtube.com/watch?v=Z6f9ckEElsU
2	https://www.youtube.com/watch?v=4b1D1QFEel0

MOOCs:

ResourcesNo.	Websiteaddress
1	https://onlinecourses.nptel.ac.in/noc19_cs69/preview
2	https://www.classcentral.com/course/introduction-to-software-engineering-98973

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**CourseCode**	**Course Title**	
III	**303**	**Java Programming**	
	Prepared by	**Dr. Rahul Jadhav**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IA(40) + UA(60)	100

Course Outcomes:

After completing the course the students shall be able to:

CO1: To develop proficiency in creating console based applications using the Java Programming Language.
CO2: To interpret the concepts of object oriented Programming Language and easily use Java.
CO3: Design interfaces, abstract and concrete classes
CO4: Use concurrent programming, Java Collections and utility classes
CO5: To understand and implement File Handling in Java.
CO6:Get the main features of Java Programming for Business Applications

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	Features of Java, Java compiler,JVM, Garbage collection, Data types, concept of class and object, control structures in java, arrays in java, array of objects.	8	**CO1, CO2**	PowerPoint Presentation	Understanding	Short answer
2	Concepts of OOP, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final, Concept of package, Introduction to Exception Handling.	10	CO2, CO6	Lab Demonstration	Applying	Short answer
3	Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Using abstract and final keywords with class declaration, Concept of interface and class.	8	CO2 CO3	Lab Demonstration	Applying	Short answer
4	Concept of streams, types of streams – byte streams, character streams. The Console: System.out, System.in, and System.err, InputStream class,	8	CO4 CO5	Lab Demonstration	Applying	Short answer

	OutputStream class, File class, FileInputStreams, File OutputStream, Reader class, Writer class, FileReader, FileWriter.					
5	Introduction to GUI controls – Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu etc. Introduction to AWT and Swings **Applets:** Applet concept, creating basic applet, applet lifecycle, controlling applet content	11	CO6	PowerPoint Presentation, Lab Demonstration	Creating	Short answer

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Herbert Schildt	The Complete Reference JAVA	7th Edition	McGraw-Hill
2	Cay S. Horstmann and Gary Cornell	Core Java Volume-I	8th Edition	Sun Core Series
3	Bruce Eckel	Thinking In Java	4th Edition	Printice Hall

Online Resources:

Online Resources No.	Website address
1	https://www.w3schools.com/java/
2	https://www.javatpoint.com/java-tutorial
3	https://www.tutorialspoint.com/java/index.htm
4	https://docs.oracle.com/javase/tutorial/

MOOCs:

Resources No.	Website address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Programme:BCA CBCS-RevisedSyllabusw.e.f.-Year2022 – 2023			
Semester	Course Code	Course Title	
III	**304**	**Statistics**	
	Prepared by	**Dr. Sheetal Deshmukh**	
Type	Credits	Evaluation	Marks
MDC	3	IE(40) + UA(60)	100

Course Objectives:

To make students to:

- To understand the statistical concepts.
- To provide knowledge related to various tabulation methods and representation of data.

To learn and apply Measures of Central Tendencies, Measures o Dispersion, Regression and Correlation Analysis.

Course Outcomes :

After completion of the course the students shall be able to

CO1: Understand types of statistical data, data collection and representation of data.

CO2: Explain the concepts of Measures of Central Tendencies, Measures o Dispersion, Regression and Correlation Analysis.

CO3: Solve examples applying Measures of Central Tendencies, Measures o Dispersion, Regression and Correlation Analysis.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Introduction to Statistics Data Collection and representation:** Definition of Statistics, Importance of Statistics, Scope of statistics, Limitations of Statistics, Advantages and Disadvantages of Statistics. **Types of data**: Primary and Secondary data, Sources of Data collection, **Tabular Representation of data:** Ungrouped and grouped frequency distribution, Graphical	13	CO 1 CO 2 CO 3	Lecture with PPT, White board	Understand	Quiz, Assignment Questions, Class Test

	representation of data: Histogram, frequency polygon and Curve, Cumulative frequency curves (ogive curves).					
2	**Measures of central tendency:** a) **Mean**: Definition, problems on mean for individual observations, ungrouped frequency distribution and grouped frequency distribution, merits and demerits, Examples. b) **Median:** Definition, problems on median individual observations, ungrouped frequency distribution and grouped frequency distribution, merits and demerits, Examples. c) **Mode:** Definition, problems on mode for individual observations, ungrouped frequency distribution and grouped frequency distribution, merits and demerits, Examples.	9	CO 1 CO 2 CO 3	Lecture with PPT, White board	Apply	Quiz, Assignment Questions, Class Test
3	**Measures of Dispersion:** a) **Range:** Definition,problems on range for individual observations, ungrouped frequency distribution and grouped frequency distribution, merits and demerits of Range, Examples. b) **Mean Deviation**: Definition, problems on mean deviation about mean for individual observations, ungrouped frequency distribution and grouped frequency distribution, merits and demerits, Examples. c) **Standard Deviation**: Definition, problems on standard deviation for individual observations, ungrouped frequency distribution and grouped	9	CO 1 CO 2 CO 3	Lecture with PPT, White board	Analyze	Quiz, Assignment Questions, Class Test

	frequency distribution, merits and demerits. Coefficient of variation, coefficient of Determination and Standard error, Examples					
4	**Correlation Analysis:** Introduction, Types of Correlation, Scatter Diagram , Karl Pearson's coefficient of correlation, Properties and Interpretation of Correlation coefficient, Merits and Demerits of Karl Pearson's Coefficient, Spearman's Rank correlation Coefficient, Examples	7	CO 1 CO 2 CO 3	Lecture with PPT,White board	Create	Quiz, Assignment Questions, Class Test
5	**Regression Analysis**: Introduction to Regression Analysis, Lines of Regression Equation: A)Regression Equation of Y on X, B) Regression Equation of X on Y , Properties of Regression co-efficient , problems on finding regression equations and estimations	7	CO 1 CO 2 CO 3	Lecture with PPT, White board	Analysis & Evaluation	Quiz, Assignment Questions, Class Test

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	S.P.Gupta	Statistical Techniques	46th Edition	Pearson
2 National	Ranjeet Chitale	Statistical Techniques	1st edition	Nirali Prakashan

Online Resources

Online Resources No.	Web site address
1	https://www.geeksforgeeks.org/measures-of-central-tendency/
2	https://www.cuemath.com/data/measures-of-dispersion/

MOOCs:

Resources No.	Web site address

1	www.Swayam.Com
2	www.nptel.com

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
III	**305**	**Lab on Oracle**	
	Prepared by	**Dr. Hanmant Renuse**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	IA(40) + UA(60)	100

Course Objectives:

- To provide a strong formal foundation in database concepts and implementation
- To provide practice to the participants to groom them into well informed database application developers.
- To understand the Architecture of Oracle database.
- To design and develop a relational database system with appropriate functionality to process data with integrity constraints and avoid data redundancy.
- To implement queries using SQL (Structured Query Language)
- To work with various objects of Oracle.

Course Outcomes:

After completing the course the students shall be able to:

CO1-To provide a strong formal foundation in database concepts and implementation.
CO2-To provide practice to the participants to groom them into well informed database application developers.
CO3-To understand the Architecture of Oracle database.
CO4-To design and develop a relational database system with appropriate functionality to process data with integrity constraints and avoid data redundancy.
CO5-To implement queries using SQL (Structured Query Language)
CO6-To work with various objects of Oracle.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	**Introduction to Oracle:** History, Architecture, Features, Versions of Oracle, Oracle File Management, Spool command **SQL:** SQL query Rules, Data types, Keywords,Delimiters, Literals. Defining a database in SQL. **Components of SQL:** DDL, DML, DCL,DQL, DDL Commands – Defining a database inSQL, Creating table, changing table definition, removing table. DML Commands- Inserting, updating,	6	**CO1, CO3**	PowerPoint Presentation	Understanding	Short answer

	deleting data. DQL Commands: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table.					
2	**Data Constraints** Primary key, Foreign Key, NOT NULL, UNIQUE, CHECK constraint.	6	CO2, CO4	Lab Demonstration	Applying	Short answer
3	**Operators:-** Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect.	6	CO5	Lab Demonstration	Applying	Short answer
4	**Joins and Oracle Functions:-** Join Concept. Simple join, equi join, non equi join, Self-join, Outer join, Sub queries, Aggregate Functions, Numeric Functions, String Functions, Conversion functions, Date conversion functions, and Date functions.	6	CO5	Lab Demonstration	Applying	Short answer
5	**Database Objects :-** **Index**: Creating index, simple index, composite index, unique index, dropping indexes, multiple indexes on table **Sequence**: Creating sequence, altering sequence, dropping sequence. **Views**: Concept, creation, usage	6	CO6	PowerPoint Presentation, Lab Demonstration	Creating	Short answer

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Ivan Bayross	SQL,PL/SQL The programming – Language of Oracle	3rd Edition	BPB Publication
2	Bob Bryla , Kevin Loney	Oracle Database 12c The Complete Reference (Oracle Press)	2nd Edition	Oracle Press
3	Sanjay Mishra & Alen Beaulieu	Mastering Oracle SQL	--	O'Reilly

Online Resources:

Online Resources No.	Web site address
1	SQL Tutorial for Beginners: https://www.youtube.com/watch?v=wkOD6mbXc2M
2	https://www.mygreatlearning.com/blog/sql-tutorial-for-beginners/
3	SQL TUTORIALS FOR BEGINNERS: https://www.youtube.com/watch?v=zPes5jBZ62c
4	Learn SQL (Structured Query Language) | Edureka https://www.youtube.com/watch?v=BPHAr4QGGVE

MOOCs:

Resources No.	Web site address
1	https://www.classcentral.com/institution/oracle
2	https://www.mooc-list.com/tags/oracle
3	https://in.coursera.org/courses?query=oracle

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
III	**306**	**Lab on JAVA**	
	Prepared by	**Dr.Rahul Jadhav**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	IA(40) + UA(60)	100

Course Outcomes:

After completing the course the students shall be able to:

CO1: Provide foundation for programming and Enable the students to analyze and efficiently solve the problems using Java Programming

CO2: To develop proficiency in creating console based applications using the Java Programming Language.

CO3: To interpret the concepts of object oriented Programming Language.

CO4: To develop logical abilities of students using Java Programming language

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	Program to demonstrate the following: 1. Branching Statements 2. Looping Statements 3. Classes and objects 4. Arrays 5. Array of objects.	8	CO1, CO2	Lab Demonstration	Applying	Short answer
2	Design Programs on following concepts: 1. Constructor 2. Constructor Overloading 3. Pass by value 4. Method Overloading 5. Package 6. Exception Handling	10	CO2,	Lab Demonstration	Applying	Short answer
3	Working with Inheritance and Interface: 1. Programs to demonstrate working of Inheritance, types of inheritance and Polymorphism – function overriding. 2. Making use of abstract and final keywords with class declaration.	8	CO2 CO3	Lab Demonstration	Applying	Short answer

	3. Programs to demonstrate working of interface.					
4	Program to demonstrate Java Input/Output : 1. Concept of streams, byte streams, character streams. 2. The Console: System.out, System.in, and System.err 3. Making use of InputStream class, OutputStream class, File class, FileInputStreams, File OutputStream, Reader class, Writer class, FileReader, FileWriter. Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter. Object Streams	8	CO4	Lab Demonstration	Applying	Short answer
5	Write a java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t).it takes a name or phone number as input and prints the corresponding other value from the hash table(hint: use hash tables) Implement the above program with database instead of a text file.	11	CO4	Lab Demonstration	Applying	Short answer

ReferenceBooks:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Herbert Schildt	The Complete Reference JAVA	7th Edition	McGraw-Hill
2	Cay S. Horstmann and Gary Cornell	Core Java Volume-I	8th Edition	Sun Core Series
3	Bruce Eckel	Thinking In Java	4th Edition	Printice Hall

Online Resources:

Online Resources No.	Website address
1	https://www.w3schools.com/java/
2	https://www.javatpoint.com/java-tutorial
3	https://www.tutorialspoint.com/java/index.htm
4	https://docs.oracle.com/javase/tutorial/

MOOCs:

Resources No.	Website address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS – Revised Syllabus w.e.f – 2022-2023			
Semester	**Course Code**	**Course Title**	
III	**307**	**Startup Management**	
	Prepared by	**Mr.Dexter Woodward**	
Type	**Credits**	**Evaluation**	**Marks**
AEC	2	IA	50

Course Objectives:

1. To inspire the student Fraternity with entrepreneurial mind sets and encourage them tobrainstorm ideas for a startup.
2. To identify various sources of funding and how one can raise capital for a startup.
3. To Outline various phases of the new ventures and help one to identify growing markets.
4. To acquire skills to overcome challenges one faces in a startup.

Course Outcomes:

CO1: Students will get a better understanding of how to establish a startup and variousoptions available for startup.

CO2: Better Understanding of capital raising and other legal requirements for a new venture.

CO3: Develop in students requisite qualities of an entrepreneur

CO4: Helps a student from the desire of a start up to a complete entrepreneur

Unit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	**Introduction to StartupManagement** • What is a startup • Interception of a startup,idea generation. • Business startup, venturechoice • Startup prominence in theIndian Scenario • Role of the Government inpromotion of startups • The six forces of change.	7	CO 1 CO 2	Lectures, Experts form Industry Case study	Understanding Remembering Planning	Quiz Class test
2	**Venture capital and StatutoryEnvironment** • Identifying startup capital • Sources of capital and • Funding	8	CO2	Lectures Case Studies Group	Understanding Implying Analysing	Class Test Online Quiz Group Discussion

	• Estimation of fund • requirement for a startup • Positioning of a new startup / Venture • Approval of new venture • Tax structure and tax discounts for new ventures • Legal environment for startups and new ventures • Case study			Discussion	Learning	
3	**Financial aspects at the start and during growth phase** • Feasibility Analysis • Ways and means of raising funding's • Equity Funding • Crowd funding • Seed funding • Alliance and Partnership • Growth strategies and market growth. • Venture life patterns and reasons of failure. • Case Study	7	CO3 CO4	Lectures Case studies Presentation Evaluation Field Visits	Understanding Exploring Implementation	Online Tests Internship
4	**Growth, Failure and Exit** • Stages of Growth • Venture life partners • Failure and reason of failure • Preparing for change • Leadership successor • Dealing with bankruptcy • Exist strategies, sale of startup, being acquired /going public / liquidation Pitch deck, MVP, POC	8	CO4	Lectures Case study	Learning Understanding Exploring Implementation	presentation

Sr. No.	Name of the Author	Title of the Book	Year Edition:	Publisher Company
1	Anjan Raichaudhuri	Managing New Ventures Concepts and Cases	2010	Prentice Hall International
2	S.R. Bhowmik and M. Bhowmik	Entrepreneurship	2011	New Age International,
3	Vijay Sathe,	Corporate Entrepreneurship	2009	Cambridge,

4	Steven Fisher, Janae' Duane, ,	The Startup Equation -A Visual Guidebook for Building Your Startup,	2016	Indian Edition Mc Graw Hill Education India Pvt. Ltd,

5	Peter F. Drucker ()	Innovation and Entrepreneurship	2007	Classic Drucker Collection, 2007

Online Resources	Website address
1	1https://www.cloudways.com/blog/best-startup-tools/ The 30 Best Startup Tools & Resources to Grow Your Business
2	https://otm.illinois.edu/sites/default/files/StartUp%20Handbook%20for%20web.pdf The Start-up Handbook
3	https://visme.co/blog/wp-content/uploads/24-Essential-Tools-and-Resourcesfor-Entrepreneurs-by-Visme.pdf 24 Essential Tools and Resources for Startups and Entrepreneur

MOOCS	Website address
1	https://www.mooc-list.com/tags/startup
2	https://www.mooc-list.com/course/entrepreneurial-mindset-coursera
3	https://www.my-mooc.com/en/categorie/entrepreneurship

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
III	**308**	**Yoga and Meditation**	
	Prepared by	**Dr.Anita Patil**	
Type	**Credits**	**Evaluation**	**Marks**
VBC	2	IA	50

Course Objectives:

- To provide the basic knowledge of the theory and practice of yoga so that the students learn to practice asana
- To build awareness of yoga among student
- To promote positive health and holistic wellness

Course Outcomes:

CO1: Study Yogasana, Kriya, Bandhas, Mudra, Meditation and Pranayama
CO2: Demonstrate and practice Yoga exercise for wellness.

Unit No	Content	Session (hrs.)	CO Number	Teaching Methodology	Cognition (As per Bloom's Taxonomy)	Evaluation Tools
1	What is Yoga? Brief history and development of Yoga. The Fundamentals of Yoga Traditional Schools of Yoga Yogic practices for health and wellness General Guidelines for Yoga Practice Prayer	5	CO 1 CO2	Lecture with PPTs	Understand	End Term: Applied Questions
2	Preparatory Exercises I. Neck Bending II. Trunk Movement III. Knee Movement IV. Other movements Surya Namaskara and Benefits	5	CO 1 CO2	Lecture with Ppts Quiz	Apply (Analyse)	Quiz End Term Internals: Short Answers
3	Definition, Benefits A. Standing Asana Tadasana ,Vṛikṣasana , ArdhaChakrasana Trikoṇasana,	10	CO 1 CO2	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied

	Virasana B. Siting Asana ArdhaUṣṭrasana, Sanskarsana Vakrasana, Vajrasana C. Pron Asana Bhujangasana, Shalabhasana Dharunasan, Makarasan D. Supine Asana Setubandhasana, Pavanamuktasana Sarvangasana, Savasana, Eye Exercises					
4	and Praṇayama Meditative Postures :Sukhasan, Swastikasana; Vajrsan; Ardhapadmasan, Padmasan, Siddhasan Preparatory Breathing Practices Sectional Breathing (Abdominal, Thoracic and Clavicular Breathing) Yogic Deep Breathing Concept of Puraka, Rechaka and Kumbhaka OM Meditation Shuddikriya Definition, Benefits, Kapalbhati Trataka Praṇayama Definition, Benefits, NadiSodhana / AnulomaViloma BhramariPraṇayama	10	CO 1 CO2	Lectures with PPTs Case Activity	Analyse	Activity End Term: Theory Applied

Reference Books:

Sr.No.	Name of the Author	Title ofthe Book	Year Edition	Publisher Company
1	Goyandka, Harikrishandass	Yoga Darshan	2010	Geeta Press, Gorakhpur
2	DhirendraBrahmachari	Yogic SuksmaVyayma	1986	Dhirendra Yoga Publications, New Delhi,
3	Joshi, K.S.	Yoga in daily life	1985	Orient paper backs Delhi
4	VishwasMandlik	Yoga Parichay		
5	Saraswati, Swami Satyananda	Asana, Pranayama, Mudra, Bandha	2006	Yoga Publications Trust Bihar School of Yoga, Munger,

Online Recources:

Sr.No	URL
1	https://yoga.ayush.gov.in/public/assets/front/pdf/CYPEnglishLeaflet.pdf

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**Course Title**	
IV	**401**	**Computer Networks**	
	Prepared by	**Mr. Prasanna Rasal**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IE(40) + UA(60)	100

Course Objectives:

- To acquire a foundational understanding of computer network and communication technologies.
- To provide knowledge regarding various network protocols.
- To understand the Advanced Network Technologies and applications of Network.

Course Outcomes:

After completing the course

CO1: Students will acquire a good knowledge of the computer network, its architecture and Operation.

CO2: Student will be able to pursue his study in advanced networking courses.

CO3: Students will be able to follow trends of computer networks. So, students will get exposureof advanced network technologies like MANET,WSN,4G and 5G.

Unit	Content	Session (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Introduction to Computer Networks	What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Typesof Networks. Network software: Network Protocols, Protocol Hierarchies, Connection Oriented and Connectionless Services. Network Models: The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, Examples of some networks: Internet, X.25,ISDN, Frame relay, ATM, Ethernet, Wireless LAN-(Wi-Fi).	8	CO 1	Lecture with PPTs Quiz	Understand	End Term Internals: Short Answers

Data Transmissio n and Physical Layer	Signals: Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum Transmission Media & its Characteristics: Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM,WDM,TDM, Switching: Circuit, Message and Packet Switching, MobileTelephoneSystems:1G,2G,3G,4 G,5G	9	CO2	Lecture with PPTs Video	Understand& Evaluate	End Term Interna ls: Short Answe rs
Network Layer: Design Issues and Routing Algorithms	Static/ Dynamic, Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, IP Addressing: IP-Protocol, IP-Address Classes (A, B, C, D,E), Broadcast address, Multicast address, Network Mask, Subnetting, Internet Control Protocol-ICMP, IGMP, Mobile-IP, IPv6	10	CO2	Lecture with PPTs Video	Understand& Evaluate	Assign ments End Term Interna ls: Short Answe rs
Transport and Application Support Protocols	Transport service, Service Primitives, Internet, and TransportProtocols: TCP/UDP, Remote Procedure Calls, RTP **Session Layer:** Token Concept **Presentation Layer:** Data Encryption and Data Security, Message Authentication **Application Layer:** Domain Name Service, Telnet, FTP, SMTP,SNMP, MIME,POP,IMAP, WWW,HTTP	8	CO2	Lecture with PPTs Quiz	Analyse	Classro omtest End Term Internals: Short Answer s

Advance Networks and Internet	Concept of 5G Networks, Introductionof 802.16,802.20, Bluetooth, Infrared,MANET,SensorNetworks.TechnicalIssuesofAdvancedNetworks. **Mobile Ad-hoc Networks:** Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad-hoc On-Demand Distance Vector Protocol **Wireless Sensor Networks:** Sensor networks overview: Introduction, applications, design issues, requirements. **Internet Basics:**Concept and Characteristics of Internet, Intranet, Extranet. Structure of Internet, Application of Internet andConcept of Domain name.	10	CO3	Lecture with PPTs Case Studies	Understand& Apply	Quiz End Term Internals: Short Answers

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	A.S. Tanenbaum	Computer Networks	6th Edition	Prentice-Hall of India
2	W.Behrouz Forouzan and S.C.Fegan	Data Communication and Networking	5thEdition	McGraw Hill
3	Uyless D. Black	Computer Networks	8thEdition	Prentice Hall

Online Resources:

Online Resources No.	Website address
1	https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm
2	https://www.javatpoint.com/computer-network-tutorial
3	https://www.youtube.com/watch?v=4D55Cmj2t-A
4	https://www.youtube.com/watch?v=ET2W8DyA7zI

MOOCs:

Resources No.	Website address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
II	**402**	**Advanced Java**	
	Prepared by	**Dr.Suvarna Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

Course Objectives

- To learn implementation of Thread
- To understand collection classes and interfaces.
- To understand working socket and using it for simple communication
- To acquire knowledge about handling databases using Java.
- To study web components for developing web applications

Course Outcomes :

CO1: Understand the concept of Concurrent Programming, Network programming, JDBC, Servlet and JSP
CO2: Apply the concept to write simple socket programs, server side validation**CO3**: Create and deploy a web application using Servlet and Java Server Pages **CO4**: Demonstrate the data retrieval from Database using JDBC

Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
Concurrent Programming Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods	8	CO 1	Lecture with Ppts	Understand	Quiz Short Answers
Java Collections and Utility Classes Introductions to generics: generic types and methods Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, making use of Iterator to access collection elements	8	CO 2	Lecture with Ppts	Understand	Quiz Short Answers

Java Network Programming The java.net package, Connection oriented transmission – Stream, Socket Class, Creating a Socket to a remote host on a port, (creating TCP client and server), Simple Socket Program Example	10	CO2	Lecture with PPTs	Understand	Quiz Short Answers
Java Database Connectivity The role of JDBC, jdbcconfiguration, Types of drivers, Connectivity with database, JDBC Statements –Statement, PreparedStatement, CallableStatement, Scrollable and updatable result sets, Metadata – DatabaseMetadata, ResultSetMetadata	10	CO3	Lectures with PPTs	Understand	Quiz Short Answers
Java Servlet Introduction to Servlets and Hierarchy of Servlets , Life cycle of a servlet, Tomcat configuration, Handling get and post request (HTTP), Handling a data from HTML to a servlet, Session tracking – Cookies and Http Session **Java Server Pages** Simple JSP program, Life cycle of a JSP, Implicit Objects, Scripting elements – Declarations, Expressions, Scriplets, Comments JSP Directives Page Directive, include directive, Mixing Scriplets and HTML	9	CO3	Lecture	Create	Quiz Short Answers

Reference Books

Sr. No.	Name of the Author	Title of the Book	Publisher Company
1	Cay S. Horstmann	Core Java Volume I - Fundamentals	PHI
2	Herbert Shildt	The Complete Reference	McGraw-Hill Education,
3	Cay S. Horstmann	Core Java Volume II – Fundamentals	Prentice Hall
4	Steven Holzner	Java 2 Programming	DreamTech Press
5	Cay S. Horstmann and Gary Cornell	Core Java-Volume-2	Sun Core Series

Online Resources

Online Resources No.	Web site address
1	https://www.tutorialspoint.com/
2	https://www.javatpoint.com/
3	https://www.w3schools.in/

MOOCs:

Resources No.	Web site address
1	NPTEL
2	Swayam
3	edx.com
4	coursera.com

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**CourseTitle**	
IV	**403**	**Advanced HTML with JavaScript and CSS**	
	Prepared by	**Dr. Swati Desai**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSC	**3**	UE(60)+IE(40)	100

Course Objectives:

Objectives :

- To learn Web Supporting Technologies and develop website

Course Outcomes:

CO1: To remember basic concepts of Web Supporting Technologies.
CO2: To understand syntaxes of HTML, HTML5, CSS and JavaScript
CO3: To design web pages by applying HTML, HTML5, CSS and JavaScript.
CO4: To analyze and solve real life problem using web supporting technology given in the syllabus.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Overview of HTML**, concept of Tag, types of HTML tags, structure of HTML program, Text Formatting Through HTML: Emphasizing Material in a Web Page, Using Image tag, attributes of Image tag, Lists: Using unordered, ordered, definition lists, Handling Tables: To define header rows & data rows, use of caption tag, changing height & width of	10	CO1, CO2,	Explanation, Demo, PPT	understand	Q-A in class, Quiz, theory assignment, Lab assignments, Mid Term Exam,

	table, BGcolor, Handling Tables: cell padding, cell spacing, colspan, row span, handling table data, images in table, Frames: Introduction To frames, using frames & framesets, named frames, Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, image as hyperlinks					
2	**HTML5** Introduction to HTML5, Features of HTML5, Elements of HTML5, HTML Media and Graphics	7	CO1, CO2	Explanation Demo, PPT,	Remember	Q-A in class, Quiz, theory assignment, Lab assignments
3	**Cascading Style Sheets:** Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors, Using class and span tag, External style sheets,	7	CO1, CO2, CO3	Explanation, Demo, PPT	design	Q-A in class, Quiz, theory assignment, Lab assignments, Case based example solving
4	**Introduction to JavaScript (Client-Side Scripting):** Introduction to scripting, overview of Java Script, advantages, client-side java Script, capturing user input, writing JavaScript into HTML, Advantages and limitations of JavaScript, **JavaScript Basics:** Data types, literals, variables and	12	CO1, CO2, CO3, CO4,	Explanation, Demo, PPT	analyse	Mini projects, team work,

	operators, Java Script arrays, dense array, operators, expressions, **JavaScript Programming Constructs:** Assignment, data declaration, if, switch, while, for, do while, label, break, continue, function call, return, with, delete, method of invocation **Dialog boxes** -Alert dialog box, prompt dialog box, confirm dialog box, window objects **JavaScript Functions**- Types of functions in Java Script- Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions Arrays- Introduction to arrays, arrays with methods					
5	**Forms:** Interactive web pages concepts, difference between static & dynamic web pages, Concept of form, how form works, Different elements - text, password, button, submit, reset, checkbox, Radio, Text Area, select & option, properties of form elements, form object's Method, Otherbuilt-in Object: String object, math object, date object, Regular Expressions, Form validation **JavaScript Events:**	9	CO1, CO2, CO3, CO4	Explanation, Demo, PPT	Create	Case Presentation Activity End Term: Theory Applied

	What is an Event? Onclick Event Type, onsubmit Event Type, onmouseover and onmouseout, onchange, onload, onkeydown, working with DOM, Concept of Cookies and sessions, when and how to use cookies and sessions,					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Dromey	How to solve computer	2015,3rd edition	PHI Publication
2	P. K. Sinha	Computer Fundamentals	12thedition	PBP Publication
3	V. Rajaraman	Computer Fundamentals	6TH EDN. 2014	PHI Publication

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www. edx.com
2	www.coursera.com

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme:BCA CBCS– RevisedSyllabusw.e.f.-Year2022 –2023			
Semester	**CourseCode**	**Course Title**	
IV	**404**	**Optimization Techniques**	
	Prepared by	**Dr.A.B.Nadaf**	
Type	**Credits**	**Evaluation**	**Marks**
MDC	3	IE 40 + UA(60)	100

Course Objectives:

- To make students to get familiar with basic concepts of Optimization Techniques
- To impart knowledge of the Linear Programming,Transportation model & Assignment model
- To apply CPM and PERT techniques in Project Management.

Course Outcomes:

After completing the course, the students shall be able to

CO1: Understand the basic concepts of Optimization Techniques.
CO2: Design the optimal problem solving techniques using Linear Programming Problem.
CO3: Understand the concept of transportation and Assignment problem.
CO4: Design Solution by using Network Theory .
CO5: Design the Decision Table and Decision Tree for the given problem

Unit	Content	Hrs	COs No	Teaching Methodology	Cognition Level	Evaluation Tools
1	Origin of Optimization Techniques,History ,Methodology, different phases, Characteristics, Scope ,Applications of Optimization Techniques, Limitations of Optimization Techniques Introduction and requirement of LP, Assumption and Formulation of LP, General Statement of LP, Solution of LP by using Graphical Method(Maximization & Minimization), Special cases in Graphical Method- i)Alternative solution ii)Unbounded Solution iii)Infeasible solution	08	CO1	Power point Presentations, Classroom Sessions	Understand	Assignment Quiz

2	Linear Programming formulation of Transportation Problem, General Procedure to solve Transportation Problem, Methods for finding Initial Feasible Solution-i)North -West Corner Method ii)Least CostMethod iii)Vogel's Aproximation Method, Final Transportation cost using MODI Method. Special Cases :i)Unbalanced problem ii)Mutiple Optimum Solution iii)Prohibited Routes iv)Case of Degeneracy	12	CO2, CO3	Power point Presentations, Classroom Sessions	Remember	Case Study Discussion , Class Test' Class Assignment
3	Introduction, Hungerain Method to solve Assignment problem, Special cases- i)Unbalanced Problem ii)Alternate Solution iii)Prohibited Assignment iv)Maximization Problems	8	CO3	Power point Presentations, Classroom Sessions	Understand , apply	Case Study, Question and Answer,
4	Terms used in Network Analysis, Rules for Network construction, Drawing network diagrams, Backward Pass Calculation, Forward Pass Calculation, Critical Pass Method, Time estimates for critical path, PERT, Types of Float (Theoretical point of view only) , Probability of completion of project	8	CO4	Power point Presentations, Classroom Sessions	create	Case Study,

5	Elements of Decision making problem, Decision making under risk-i)Expected Monetary value criterion ii)Expected value with perfect information iii)Expected Value of perfect information (E.V.P.I.)iv)Expected Opportunity Loss Decision Making under uncertainty-i)Maximax (gain) or Minimin (loss) criterion ii)Maximin criterion iii)Hurwicz Alpha criterion iv) Laplace criterion v) Minimax Regret criterion Decision Tree -simple Examples	9	CO5	Power point Presentations, Classroom Sessions	create	assignment

Reference Books

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	J.K. Sharma	Operations Research	2016	Laxmi Publications
2	Kanti Swaroop, P.K. Gupta, Man Mohan	Operations Research	2019	Paperback
3	R. Panneerselvam	Operations Research : :Introduction to ManagementScience	2006	2019 Prentice Hall of India Pvt Ltd
4.	S. Kalavathy	Operations Research	2006	Vikas Publishing House

Online Resources:

OnlineResourcesNo.	Website address
1	https://www.youtube.com/watch?v=knZrhVkZ71Q&list=PLU6SqdYcYsfLyEPjMPHT_1ZhTRrnXA55R
2	https://www.youtube.com/watch?v=9vJx6tZgVQs&list=PLU6SqdYcYsfLyEPjMPHT_1ZhTRrnXA55R&index=14
3	https://www.youtube.com/watch?v=ydvnVw80I_8
4	https://www.youtube.com/watch?v=oBPlVV6AiPQ&list=PLEjRWorvdxL6LnWXJxnFB_9DXHhUxJ3dk&index=2

MOOCs:

Resources No.	Website address
1	https://www.youtube.com/watch?v=BDBhpxRzImI&list=PLWoXNEI-KK1mCv_EL4OdF_-6FXryaZ11N
2	https://www.youtube.com/watch?v=66aKgySf9vo&list=PLLy_2iUCG87Bq8RGMTdeFZiB-87V4i9p1
3	https://www.youtube.com/watch?v=a2QgdDk4Xjw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYcNtsoX

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
IV	**405**	**Lab on Advanced JAVA**	
	Prepared by	**Dr.Rahul Jadhav**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	IA(40) + UA(60)	100

Course Outcomes:

After completing the course the students shall be able to:
CO1: Write Java code by making use of thread
CO2: Construct a web application using Servlet and Java Server Pages
CO3: Implement server-side validations with session
CO4: Retrieve data effectively from database using JDBC
CO5: Develop and deploy web-based enterprise applications

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	Write a program to demonstrate Multi-threadingusing Thread Class. Write java program toimplement Runnable interface Write java program for demonstrating concept of Thread synchronization. Write java code for implementing the following Inter-thread communication methods: usingwait(), notify(),notifyAll()	6	**CO1**	Lab Demonstration	Applying	Output / answer

2	Develop java programs to implement Simple generic class and methods Write java programs to demonstrate concept of ArrayList, Vector and LinkedList. Write java code to implement Iterator to access collection elements. Write java programs to demonstrate concept of HasSet, LinkedHashSet and TreeSet.	6	CO1	Lab Demonstration	Applying	Output / answer
3	Write a Java program to create a simple TCP client and server Write a Java program to compare TCP and UDP communication. Write a Java program to implement a simple time server and client. Write a Java program to transfer a file from a client to a server.	6	CO4	Lab Demonstration	Applying	Output / answer
4	Implement jdbc connectivity to insert records and delete records into a table. Implement jdbc connectivity to demonstrate PreparedStatement. Write java code to demonstrate stored procedures with Callable Statement. Write java code to implement concept of Scrollable and updatable result sets. Write java code to Making use of Database Metadata and ResultSetMetadata	6	CO2 CO3	Lab Demonstration	Applying	Output / answer
5	Write a servlet program to create a simple servlet and test it. Write a servlet program to read the client request parameters. Implement a Servlet to generate Multiplication Table for a Number Entered in Html Page. Develop an application/s to demonstrate all the core tags available in JSP (Declaration, Expression, Directive and Scriptlet Tag) Develop a JSP Application to accept Details from user and store it into the database table. Develop a JSP Application to Authenticate User login as per registration details. If login success the forward user to Index Page otherwise show login failure Message. Write a web based student registration application where students can register online with their enrolment number. The registered students should be able to log on to the site aftergetting registered. You are required to use JSP, Servlet and JDBC	6	CO4 CO5	Lab Demonstration	Applying	Output / answer

ReferenceBooks:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Herbert Schildt	The Complete Reference JAVA	7th Edition	McGraw-Hill
2	Cay S. Horstmann and Gary Cornell	Core Java Volume-I	8th Edition	Sun Core Series
3	Bruce Eckel	Thinking In Java	4th Edition	Printice Hall

Online Resources:

Online Resources No.	Website address
1	1 https://docs.oracle.com/javase/tutorial/
2	2 https://www.javatpoint.com/java-tutorial
3	3 https://www.programiz.com/java-programming

MOOCs:

Resources No.	Website address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**Course Title**	
IV	**406**	**Lab on HTML, JavaScript, and CSS & Project - I**	
	Prepared by	**Dr. Ayesha Mujawar**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	IE(40) + UA(60)	100

Course Objectives:

To make students to:

- To teach the basic internet concepts and train them to develop internet applications.
- An overview of the HTML5 specification
- Practical knowledge to implement new HTML5 elements and attributes.

Overview of JavaScript

Course Outcomes:

After completing the course
After completing the course the students shall be able to

CO1: To design simple web pages using HTML.
CO2: To design web pages using text formatting, list, image tags in HTML.
CO3: To apply various CSS styles to design pages.
CO4: To apply various programming constructs and event handling mechanism using JavaScript for designing web pages.
CO5: To develop minor project individually or in group.

Unit	Content	Sessions	CO Number	Teaching Methodology	Cognitive Level	Evaluation Tools
Basics of Internet	1. Design A webpage which has student's biodata with proper formatting and having student name as title. 2. Design a website for PNG jewellers, having images of different types of jewelleries which are linked with the pages giving details about the items.	5	CO1	Live Demo	Create	Quiz

Introduction to HTML	1. Design a website for a class which shows student's listlinked with their biodata pages. 2. Design a web page to display the following output. • List of subjects o Semester III ▪ C++ ▪ Dot.Net o Semester III ▪ Java ▪ Industrial Projects • Internet Programming o HTML o VBScript o Java Script 3. Design a website for the college which lists all the faculties (ordered lists), courses (definition lists) every course explains details (fees, duration, intake capacity) as unordered list. 4. Create a form having textboxes, radio buttons and check boxes and reset button. On clicking the reset button, the entire form should be reset.	5	CO2	Live Demo	Create	Quiz
Cascading Style Sheets	1. Design a Style sheet to give following effects. The first latter of the paragraph should have 150% font size. The first line of the paragraph should have purple as background color and white as the fore color. 2. Design a website for a college showing features of the university, college and list of different courses running in the institute. Course names have links with the pages having	6	CO3	Live Demo	Create	Quiz

	details of the courses having similar design using stylesheets. 3. Design a CSS (inline) that displays the regular text at the center with green as background color and white as fore color and should be bold, using class.					
Introduction to JavaScript (Client-Side Scripting) **Functions & Arrays**	1. Design a form using HTMLthat accepts information about your qualification, extracurricular activities, skill sets, achievements, hobbies, and expectation fora particular job. 2. Write a JavaScript code which contains "show" button. When user clicks onshow button, first 10 terms of Fibonacci series will be displayed in text box on another HTML page. Thispage contains button "back". With this buttonuser can come back to original page. 3. Design a website which accepts a number from user and performs the selected operation(even/odd, prime/not prime,positive/negative). 4. Design a webpage which provides calculator facilities. 5. Write JavaScript to display table of numbers 2-10 (use form and form elements)	7	CO4	Live Demo	Create	Quiz
Forms **And Object Event Handling**	1. Design a webpage which accepts users informationwith validations (name, std code (should not exceed 4 digits), landline number (no. of digits should be between	7	CO4 CO5	Live Demo	Create	Quiz

	5 to 7), mobile number(exactly 10 digits), email (should have @ and.)). 2. Develop a HTML form which accepts mathematicalexpression in one textbox and display its result in another textbox after clicking on a button showing mathematicaloperations. 3. Create a HTML form that has a number of textboxes. When the form runs in the browser fill the textboxes with data. Write the JavaScript code which verifies that all textboxes have been filled. If the textbox has been left empty,popup an Alert indicating which textbox has been left empty. When alert's OK button is clicked on, set focus to that specifictextbox. 4. Design webpage which accepts no of lines and prints it in the form of triangular shaped pyramid. 5. Accept data of a student wants to appear for entrance (name, marks at matriculation, higher secondary and graduation). Ask student to select the course he wants to take admission. If the student scores above 55 at matriculation, above 60 athigher secondary and graduation then he is eligible for any course. If he					

	has science degree or maths at 11th and 12th, then only he is eligible for MCA.Design the form accordingly. Give theaccording message. 6. Create a from having textboxes, radio button and check boxes and reset button. On clicking the reset button, the entire form should be reset. 7. Accept login name and password from user and display biodata of the corresponding user. 8. Design a page for a user to create his login by accepting desired login name, password and confirm the password.					

ReferenceBooks:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Ivan Bayross	Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI	2006	BPB Publications
2	Thomas Powell	Web Design The complete Reference	2004	Tata McGrawHill
3	Thomas Powell and Fritz Schneider	JavaScript 2.0: The Complete Reference, Second Edition	2004	McGraw-Hill Education; 2nd edition

Online Resources:

Online Resources No.	Website address
1	https://www.w3schools.com › html
2	https://www.javatpoint.com/html-tutorial
3	https://www.geeksforgeeks.org/html/

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS – Revised Syllabus w.e.f – 2022-2023			
Semester	**Course Code**	**Course Title**	
IV	**407**	**Cyber security**	
	Prepared by	**Dr.Shabnam Mane**	
Type	**Credits**	**Evaluation**	**Marks**
SEC	2	IA	50

Course Objectives: (CO)

1. To Understand the cyber security threat landscape.
2. To Develop a deeper understanding and familiarity with various types of cyberattacks, cyber crimes, vulnerabilities and remedies thereto.
3. To learn and apply existing legal framework and laws on cyber security

Course Outcomes:

The students will be in a position

CO1: Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
CO2:Increase awareness about cyber-attack vectors and safety against cyber-frauds.
CO3:Take measures for self-cyber-protection as well as societal cyber-protection.

Unit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1. Introduction to Cyber security	The Definition of Cyber Security : Its importance and purpose. Need for cyber security. Layered approach to cyber security Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security	12	CO 1	Lecture with practical questions based on Cases Study	Understand, Analyze	End Term: Short case and situation based questions / Applied Questions
2. Cyber crime	Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and	08	CO 2	Lecture with practical questions	Understand, Analyze, Evaluate	End Term: Short case and situation

	children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks			based on Cases Study		based questions / Applied Questions
3. Cyber law	Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organizations dealing with Cyber crime and Cyber security in India, Case studies	10	CO 3	Lecture with practical questions based on Cases Study	Understand, Analyze, Evaluate	End Term: Short case and situation based questions / Applied Questions

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1	R. C Mishra	Cyber Crime Impact in the New Millennium	2010	Auther Press. Edition
2	SumitBelapure and Nina Godbole	Computer Forensics and Legal Perspectives	First Edition, 2011	Wiley India Pvt. Ltd

Online Resources

MOOCS	Website address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
IV	**408**	**Mathematical Aptitude**	
	Prepared by	**Dr. Dhanashree Sahasrabuddhe**	
Type	**Credits**	**Evaluation**	**Marks**
AEC	2	IA	50

Course Objectives:

- To develop mathematical and logical thinking
- To prepare base for various aptitude tests being conducted by companies
- To develop their ability to draw conclusions

Course Outcomes :

CO1: To Learn various reasoning techniques.

CO2: To Apply reasoning techniques to solve real time problems

CO3: To analyse the given problem with the view of development of an efficient solution

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Numerical Reasoning** • Problems on Numbers like divisibility tests, basic arithmetic operations • LCM (Least Common Multiplier), HCF (Highest Common Factor) • Profit and Loss • Partnership • Speed and Distance • Simple and Compound Interest • Problems on ages • Simplification	10	CO 1, CO2,CO3	Lecture with Quiz	Understand and Apply	Quiz

2	**Logical Reasoning** • Series • Directions • Blood Relations • Seating Arrangements • Calendar	10	CO 1, CO2,CO3	Lecture with Quiz	Understand and Apply	Quiz
3	**Mathematical Aptitude** • Permutations and combinations • Mensuration • Set Theory • Time & Work	10	CO 1, CO2,CO3	Lecture with Quiz	Understand and Apply	Quiz

Reference Books :

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	R.S.Aggarwal	Quantitative Aptitude	2016	S.Chand

MOOCs:

Resources No.	Web site address
1	https://www.mygreatlearning.com/academy/learn-for-free/courses/crash-course-on-quantitative-aptitude-and-logical-reasoning
2	https://www.geeksforgeeks.org/quantitative-aptitude-course-free-online/

Programme: BCA CBCS Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
V	501	Basic Python Programming	
	Prepared by	Dr.M.K.Patil	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE: IE	60:40

Course Objectives

- A Python programming course is designed to equip students with a comprehensive understanding of the language and its application.
- Starting with an introduction to Python's history and community, the course guides students through setting up their development environment and mastering fundamental syntax and data types.
- Students learn control flow structures, functions, and modules, progressing to file handling, object-oriented programming (OOP) principles, and data structures.
- The curriculum includes essential skills such as error handling, debugging, and the use of popular libraries and frameworks.
- Emphasis is placed on best practices, code style, collaborative development using version control (e.g., Git), testing, and debugging techniques.
- Overall, the objectives aim to empower students with a well-rounded skill set for effective Python programming and application development.

Course Outcome

CO1: Using some motivating examples to remember and quickly builds up basic concepts such as conditionals, loops, functions, lists, strings and tuples.

CO2:Students will get acquainted built in data structures in python, understand features and programming constructs of python language. During this course, they will understand main control structures of procedural programming languages.

CO3: They will make of function to reduce problem into small modules, To familiarize withexceptions and mechanism to handle it, make use of python to read and write data into files

CO4:Analyzing the different problems based on CSV files

CO5: Ability to choose appropriate data dictionary for problem solving

CO6: Design and create their own programs for solving a real life problem

Unit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Introduction to Python:	History of Python, Unique features of Python, Python Identifiers, Keywords and Indentation, Comments and	5	CO1, CO2, CO3	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying	Assignments, Quizzes

	document interlude in Python, Getting User Input Python, Data Types, variables, Python Core objects and Functions Number and Maths					
Statements and Control Structures:	Assignment statement, import statement, print statement, if: elif: else: statement, for: statement., while: statement., continue and break statements, try: except statement., raisestatement., withstatement, del, case statement	5	CO1, CO2, CO3	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying	Lab Assignments
List, Ranges & Tuples & Dictionaries in Python	Introduction, Lists in Python, Understanding Iterators, Generators, Comprehensions and Lambda Expressions, Generators and Yield Next and Ranges, Understanding and using Ranges, Ordered Sets with tuples, Introduction to Python Dictionaries, Python Sets	4	CO1, CO2, CO3	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying	Lab Assignments
Functions, Modules, Packages, and	The def statement Returning values,	5	CO1, CO2, CO3,	Classroom Teaching, ICT-based teaching	Remembering, Understanding,	Lab Assignments

Debugging Functions:	Parameters, Arguments, Local variables,Other things to know about functions, Global variablesand the global statement, Doc strings for functions, Decorators for functions, lambda Iteratorsand generators, Modules, Doc strings for modules, Packages		CO5		Applying, Evaluating	
Python Object Oriented	Overview of OOP, Creating Classes and Objects, Accessing attributes Built-In Class Attributes, Destroying Objects	4	CO1, CO2	Classroom Teaching, ICT-based teaching	Remembering, Understanding	Lab Assignments
Python Exceptions Handling	What is Exception? Handling an exception try….except…else Try-finally clause Argumento fan Exception. Python Standard Exceptions Raising and exceptions, User-Defined Exceptions	6	CO1, CO2, CO3, CO5	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying, Evaluating	Lab Assignments
Input and Output in Python & Built in Functions	File Objects, creating a file object, reading File contents, writing data intofile, reading andwriting CSV files, using with clause, Using, Exception handling with file operations	6	CO1, CO2, CO3, CO5, CO6	Project-based teaching, ICT-based teaching	Remembering, Understanding, Applying, Analyzing, Evaluating	Lab Assignments, Live case study from the website Kaggle.com

Reference Book:

Sr. No.	Name of the Author	Titleof the Book	Year Edition	Publisher Company
1	John V. Guttag	Introduction To Computation And Programming Using Python: With Application To Understanding Data		
2	Allen B. Downey, O'reilly	Think Python		
3	Bill Lubanovic	Introducing Python: Modern Computing In Simple Packages		
4	John Zelle	Python Programming: An Introduction To Computer Science		
5	Dr. R. Nageshwara Rao, Dreamtech	Core Python Programming,		
6	Charles Dierbach, Wiley	Introduction to Computer Science using Python,		

Programme:BCA(CBCS)– Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
V	**502**	**Dot Net Programming using C#**	
	Prepared by	**Mr.Alok Shah**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSC	**3**	UE(60)+IE(40)	100

Course Objectives:

Objectives:

- To introduce .Net framework.
- To introduce C# as OOP language.
- To understand Event driven programming in C#.
- To understand working with windows forms.

CourseOutcomes:

After completing the course the students shall be able to

CO1: Understand .NET Framework, its runtime environment and application development IDE of Visual Studio.
CO2: Understand the concept of object oriented for making programs.
CO3: Implement C# language constructs in the form of stand-alone console and window form applications.
CO4: Understand database concepts in ADO.NET and apply the knowledge to implement distributed data-driven applications.

Unit	Content	Sessions	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
Introduction to Dot.Net Framework :	**History and Overview of Dot.Net framework** Framework Components and Versions **Introduction to C # :** C# Language, C# Language elements , Data types -Reference Type and Value Type, Boxing and Unboxing , Enum and Constant, Operators Control Statements, Working with Arrays and Strings , Pass by value and by reference, outparameters, Variable length parameter.	7	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers and Practical Test
Implementation of Object Oriented Concept using C#:	Object oriented concepts ,Working with Indexer and Properties ,Constructor & Destructor , Working with "static" Members,	7	CO 2	Lecture with Ppts	Understand and Apply	End Term: Applied Questions and Practical Test

	Inheritance & Polymorphism, Types of Inheritance, ,Constructor in Inheritance , Interface Implementation, Operator and method Overloading, and overriding , - Static and Dynamic Binding and Virtual , methods, Abstract Class, sealed keyword					
Exception Handling:	What is Exception, Rules for Handling Exception , Exception classes and its important properties, Understanding & using try, catch keywords, Throwing exceptions, Importance of finally block, Writing Custom Exception Classes. **Using I/O Class: Streams Class**: Text Stream and Binary Stream, System.IO and Base classes of Stream., Console I/O Streams, Working with File System -File ,FileInfo, Directory ,DirectoryInfo classes	7	CO 2	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
Delegates & Events: Introduction of Delegation:	Types of delegate, Anonymous Methods, What is Events?, Multicast Events, Lambda Expression. **Collections andGenerics:** Importance of IList and IDictionary, Collection classes:ArrayList,Hashtable, stack,queue, Writing custom generic classes, Working with Generic Collection Classes. **Multithreading:** Multithreading Fundamentals, Thread Class, Creating and Managing Threads, Threads Priority, Thread Synchronization, Suspending, Resuming and Terminatingthreads	8	CO3	Lectures with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
WinForms	**:** Introduction, Controls: Common control Group, Data, control Group, Dialog control Group,Container control Group, Menus and Context Menus: Menu Strip, Toolbar Strip., SDI and MDI Applications, Developing Custom, Composite and	8	CO4	Lecture With PPTs	Understand and Apply	End Term: Applied Questions and Practical Test

	Extended Controls, WPF, Developing WPF application					
ADO.net:	Evolution of ADO.NET , Connected and Disconnect Classes, Establishing Connection with Database, Executing simple Insert, Update and Delete , Statements, DataReader and DataAdapter, What is Dataset?, Advantages of DataSet, Working with DataRelation Prepared Statements, Stored Procedures, Master Detail Form.	8	CO4	Lectures with PPTs	Understand and Apply	Activity End Term: Theory Applied

Reference Books:

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Jesse Liberty	Programming C#		O'Reilly Press
2	Robinson et al	Professional C#"-		Wrox Press, 2002
3	Herbert Schildt	The Complete Reference: C#"-		Tata McGraw Hill
4	Jerk	The Complete Reference: Ado.Net		Tata McGraw Hill
5	Deilte	C# for programmer		Pearson
6	hilyard and teiler	C# cookbook		Orelly

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.w3schools.com/cs/index.php
2	https://www.tutorialspoint.com/csharp/index.htm
3	https://www.youtube.com/watch?v=GhQdlIFylQ8

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme: BCA-CBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
V	**503**	**Entrepreneurship Development**	
	Prepared by	**Mr.Akhilesh Jadhav**	
Type	**Credits**	**Evaluation**	**Marks**
MDC	3	UE:IE	60:40

Course Objectives:

- To understand the concept of entrepreneurship.
- To create interest amongst the students to think of becoming entrepreneurs.
- To provide ways and means to start an enterprise.

Course Outcomes:

At the end of this course, student should be able to understand

CO1: Study meaning of Entrepreneur and entrepreneurship.
CO2: Understand Role of Entrepreneurship in Economic Development, Concept of Intellectual property rights and Financial Sources
CO3: Identify Business Opportunity
CO4: Study Importance of Business plan and Support Agencies
CO5: Create new Business plan

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Introduction to Entrepreneurship :** Concept and definition of an entrepreneur,types of entrepreneurs, Qualities of good Entrepreneur, Growth of Entrepreneurship in India, role of Entrepreneurship in Economic Development, Women Entrepreneurship in India	8	CO1, CO2	Lecture with Ppts	Understand	Quiz Short Answers
2	**Business Opportunity Identification :**	8	CO 3	Lecture with Ppts	Understand	Quiz Short Answers

	Process of searchingbusiness ideas, Need of market assessment prior to finalise the product or services, Sources of market information,Environmental analysis, Government's initiatives in entrepreneurship , selection of business					
3	**Business Plan Preparation :** Meaning of Business plan, Significance and Contents of a Business Plan, developing Business Plan, Presenting Business Plan, Elevator Pitch	8	CO4,CO 5	Lecture with Ppts Case Study	Create	Quiz Short Answers
4	**Availability of Financial Sources and Assistance:** Types of Finance, Sources of Finance, Venture Capital, Start-up and Make-in-India program, MUDRA	6	CO2	Lecture with Ppts	Understand	Quiz Short Answers
5	**Support Agencies for Entrepreneurs :** Support to Entrepreneurs by DIC, SIDBI, SIDCO, SSIB, NSIC, SISI, Other Institutions etc. Entrepreneurship promotion by Government through various schemes	8	CO4	Lecture with Ppts	Understand	Quiz Short Answers
6	. **Entrepreneurial Motivation and Development :** Factors in motivating entrepreneurs, Basic course contents of EDP , Evaluation of EDP, Organizations involved in EDP, Basics of Intellectual property rights	7	CO2	Lecture with Ppts	Understand	Quiz Short Answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Vasant Desai	Dynamics of Entrepreneurial Development and Management	2001,Millennium edition	Himalaya Publication
2	Jasmer Singh Saini	Entrepreneurship Development	2003,	Deep and Deep Publications Pvt. Ltd

3	B.S Bhatia and G. S.Batra	Entrepreneurship and Small Business Management	2003	Deep and Deep Publications Pvt. Ltd
4	Dr. Sudhir Sharma Balraj Singh Sandeep Singhal	Entrepreneurship Development	1st Edition 2003	Wisdom Publications
5	Mary Coulter	Entrepreneurship I in Action	2nd Edition 2005	Prentice Hall of India Pvt. Ltd

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.vedantu.com/commerce/entrepreneurship-development-process
2	www.startupindia.gov.in
3	https://www.simplynotes.in/e-notes/mbabba/entrepreneurship-development/
4	https://www.scribd.com/document/554249314/Entrepreneurship-development-notes

MOOCs:

ResourcesNo.	Websiteaddress
1	Udemy
2	Vedantu

Programme: BCA CBCS Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
V	**505**	**Lab on Python**	
	Prepared by	**Dr.M.K.Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	UE: IE	60:40

Course Objectives

- To reinforce theoretical knowledge gained in the classroom through hands-on, practical exercises.
- To include honing skills in basic syntax and data types, mastering controlflow structures, and gaining practical experience in functions, modules, and file handling.
- To focus on applying object-oriented programming (OOP) principles andmanipulating data structures effectively.
- To provide a platform for students to develop proficiency in error handling and debugging techniques, fostering an understanding of best practices and coding standards.
- To reinforce practical problem-solving abilities, preparing students for real-world Python programming challenges.

Course Outcome

CO1: Using some motivating examples to remember and quickly build up basic concepts such as conditionals, loops, functions, lists, strings, and tuples.

CO2: By remembering students, the basic concepts students will understand the concepts of searching and sorting algorithms, dynamic programming, and backtracking, as well as topics such as exception handling and using files

CO3:Students will Have thorough knowledge of data structures and will be able to design & and develop programs for solving problems

CO4: Analyzing the different problems based on CSV files
CO5: Ability to choose an appropriate data dictionary for problem-solving
CO6: Design and create their own data structure for solving a real-life problem

Unit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Introduction to Python:	Installation of Python IDE, understanding various platforms for Python (google collaborator, Jupitar Notebook) ▪ Basic program to understand Data Types	4	CO1, CO2, CO3	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying	Assignments, Quizzes

	▪ creating variables, accepting input variables from user, and printing their datatype □ Mathematical functions (apply various operations on data +, -, /, *)					
Statements and Control Structures :	▪ Python Program to Check if a Number is Positive, Negative or Zero ▪ Python Program to Check if a Number is Odd or Even ▪ Python Program to Check Leap Year ▪ Python Program to Check Prime Number ▪ Python Program to Print all Prime Numbers in an Interval ▪ Python Program to Find the Factorial of a Number ▪ Python Program to Display the Multiplication Table ▪ Python Program to Print the Fibonacci sequence.	4	CO1, CO2, CO3, CO4, CO5, CO6	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying, Analyzing, Evaluating, Creating	Lab Assignments

	▪ Python Program to Check Armstrong Number ▪ Python Program to Find Armstrong Number in an Interval ▪ Python Program to Find the Sum ofNatural Numbers					
List, Ranges & Tuples & Dictionaries in Python	▪ Operations on Strings, Lists, tuples and arrays ▪ Creating lists/tuples/arrays and accessing list elements using index ▪ Access the list/tuple element using –ve index. ▪ Extract specific elements from list/tuple/array . ▪ Use Len(), del(), remove() and range functions on list/tuple ▪ Applying different searching and sorting algorithm on data (list) ▪ Create Dictionaries with key, value pair, and access various elements of	4	CO1, CO2, CO3, CO4, CO5, CO6	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying, Analyzing, Evaluating, Creating	Lab Assignments

	Dictionaries, Various operations using Dictionaries. Usage of map, filter functions onlist					
Functions, Modules, Packages, and Debugging Functions:	• Python Program to Find LCM • Python Program to Find HCF • Python Program to Convert Decimal to Binary, Octal and Hexadecimal • Python Program To Find ASCII value of a character • Python Program to Make a Simple Calculator • Python Program to Display Calendar • Python Program to Display Fibonacci Sequence Using Recursion • Python Program to Find Factorial of Number Using Recursion	4	CO1, CO2, CO3, CO4, CO5, CO6	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying, Analyzing, Evaluating, Creating	Lab Assignments
Python Object Oriented	Python Program to Get the ClassName of an Instance	4	CO1, CO2, CO3, CO4, CO5, CO6	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying, Analyzing, Evaluating,	Lab Assignments

	Python Program to Differentiate Between type() and is instance()				Creating	
Python Exceptions Handling	Exception handling routines programs	4	CO1, CO2, CO3, CO5, CO6	Classroom Teaching, ICT-based teaching	Remembering, Understanding, Applying, Evaluating, Creating	Lab Assignments
Input and Output in Python & built in functions	• Read, write, • search operations on File data structure • Write Programs based on exception handling • Write program for various operations on string variables	6	CO1, CO2, CO3, CO4, CO5, CO6	Project-based teaching, ICT-based teaching	Remembering, Understanding, Applying, Analyzing, Evaluating, Creating	Lab Assignments, Live case study from the website Kaggle.com

Reference Book:

Sr. No.	Name of the Author	Titleof the Book	Year Edition	Publisher Company
1	John V. Guttag	Introduction To Computation And Programming Using Python: With Application To Understanding Data		
2	Allen B. Downey, O'reilly	Think Python		
3	Bill Lubanovic	Introducing Python: Modern Computing In Simple Packages		
4	John Zelle	Python Programming: An Introduction To Computer Science		
5	Dr. R. Nageshwara Rao, Dreamtech	Core Python Programming,		
6	Charles Dierbach, Wiley	Introduction to Computer Science using Python,		

Programme:BCACBCS– Revised Syllabusw.e.f.-Year 2022–2023			
Semester	**Course Code**	**CourseTitle**	
V	**506**	**Lab on Dot Net and C#**	
	Prepared by	**Mr.Alok Shah**	
Type ofCourse	**Credits**	**Evaluation**	**Marks**
DSC	**2**	UE(60)+IE(40)	100

CourseObjectives:

Objectives:

- To learn basic C#.NET basic programming framework and designing.
- To learn and develop different C#.NET programs like classes, threads and delegations etc.

CourseOutcomes:

CO1:Display proficiency in C# by buildingst and-alone applications in the .NET framework using C#.

CO2: Create distributed data-driven applications using the.NET Framework,C#,SQLServer and ADO.NET.

CO3:Create Windows-based distributed applications using C#, SQL Server and ADO.NET

Unit	Content	Sessions	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
Basic Console Applications	• Write a C# Program to design simple calculator • Write a console application that obtain four int values from the user and displays the product. • If you have two integers stored in variables var1 and var2,what Boolean test can you perform to see if one or the other (but not both) is greater than10? • Write an application that receives the following informationfrom a set of students:Student Id: Student Name: Course Name: Date of Birth: The application should also display the	5	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers and Practical Test

	information of all the students once the data isentered. Implement this using an Array ofStructures. • Write a C# Program to Get a Number and Display the Numberwith its Reverse • Write a Program in C# to demonstrate Command line arguments processing. • Write a Program in C# to demonstrate boxing and Unboxing.					
Date and Time	• Write a C# Program to Display the Date in Various Formats • Write a C# Program to Check Whether the Entered Year is a Leap Year or Not. • Write a C# Program to find difference between Two Dates	5	CO 1	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
Classes	Write a program to demonstrate abstract class and abstract methods in C#. • Find the sum of all the elements present in a jagged array of 3 inner arrays. • Write a program to demonstrate Operator overloading. • Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.	5	CO 1	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
ADO.NET	Consider the Database STUDENT consisting of following tables: • Course (C_ID: int, C_Name: string) • Student (RollNo:int, S_ Name: string, Address: string, C_ID: int, Admissiyear: int)	5	CO2, CO3	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test

	Develop suitable windows application using C#.NET having following options: 1. Entering new course details. 2. Entering new student details. 3. Display the details of students (in a Grid) who belong to a particular course. 4. Display the details of the students who have taken admission in aparticular year					
EXCEPTION HANDLING	• write a program in C# to demonstrate error handling	5	CO 2	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
EVENTS AND DELEGATE	• To develop a C# program to implement threading concepts. • To develop a C# program to implement the following concepts: (a) Delegates (b) Events	5	CO 2	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Jesse Liberty	Programming C#		O'Reilly Press
2	Robinson et al	Professional C#"-		Wrox Press, 2002
3	Herbert Schildt	The Complete Reference: C#"-		Tata McGraw Hill
4	Jerk	The Complete Reference: Ado.Net		Tata McGraw Hill
5	Deilte	C# for programmer		Pearson
6	Hilyard and Teiler	C# cookbook		Orelly

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.w3resource.com/csharp-exercises/
2	https://home.cs.colorado.edu/~kena/classes/5448/f11/presentation-materials/csharp_dotnet_adnanreza.pdf
3	https://www.w3resource.com/csharp-exercises/

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
V	507	**IT Based Aptitude**	
	Prepared by	**Dr.Dhanashree Sahasrabuddhe**	
Type	**Credits**	**Evaluation**	**Marks**
AEC	2	IA	50

Course Objectives:

- To develop skills in understanding various constructs in basic programming
- To learn applications of different types of algorithms
- To develop skills in writing SQL queries
- To learn applications of OOP concepts
- To prepare for IT company aptitude test

Course Outcomes :

CO1: Applying and testing algorithms to various computing problems

CO2: Calculating efficiency of algorithms

CO3: Develop programming skills

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Algorithms and their complexity -** Types of algorithms, efficiency of algorithms (complexity of algorithms), sorting and searching algorithms and their complexities. basic concept of analysis design of algorithm and notations and Hashing in sorting	10	CO 1, CO2, CO3	Lecture with Ppts Quiz	Understand, Apply, Evaluate, Create	Quiz
2	**Programming with 'c' and Data Structures** Aptitude questions in 'c' with reference to datatypes, operators, different programming constructs, arrays, pointers. Aptitude questions on Linear and non-linear Data structures with reference to representation,	10	CO 1, CO2, CO3	Lecture with Ppts Quiz	Understand, Apply, Evaluate, Create	Quiz

	characteristics, traversing algorithms					
3	**Object Oriented Programming Concepts-** Aptitude on OOP with reference to Data Binding, data hiding, data abstraction, data encapsulation, class, object, inheritance, polymorphism, message passing **SQL –** Aptitude on SQL with reference to Usage, Types of commands, Select query and various options used with 'select' Relational algebra: selection, projection, union, set difference and cartesian product;	10	CO 1, CO2, CO3	Lecture with Ppts Quiz	Understand, Apply, Evaluate, Create	Quiz

Reference Books :

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	S. Sridhar	Design and Analysis of Algorithms	15/12/2014 First Edition	Oxford University Press
2	Yashvant Kanetkar	Let us c	19th Edition	BPB Publication
3	Ivan Bayross	SQL, PL/SQL the Programming Language of Oracle	4th Edition	BPB Publication
4	Rakesh Singh	OOP Concepts Booster : Take Your Coding Skills to the Next Level	25 Nov. 2019	Notion Press

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
V	**508**	**Human Rights**	
	Prepared by	**Dr.Deepali Gala**	
Type	**Credits**	**Evaluation**	**Marks**
VBC	2	IE	50

Course Objectives:

- Foundational Understanding of Human Rights
- Proficiency in Interpreting Human Rights Instruments
- Critical Analysis of Judicial Activism and Human Rights

Course Outcomes :

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

CO1: Students will acquire a solid understanding of the foundational principles, meaning, andscope of human rights

CO2: Gain proficiency in interpreting and applying human rights instruments.

CO3: Develop critical thinking skills to analyze instances of judicial activism and understand itsimplications for human rights jurisprudence

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Chapter 1:** Concept and Development of Human Rights **Meaning and Scope of Human Rights:** Define and explore the fundamental concept of human rights and their scope. **Development of Human Rights:** Trace the historical development of human rights and highlight key milestones. **Universal Declaration of Human Rights (UDHR)**	10	CO1	As per individual faculty discretion	Remember	As per individual faculty discretion

	1948: Discuss the significance and provisions of the UDHR, a landmark document in the field of human rights. **International Covenant on Civil and Political Rights (ICCPR) 1996:** Examine the provisions and implications of this international covenant. **International Covenant on Economic, Social and Cultural Rights (ICESCR) 1966:** Explore the content and importance of ICESCR.					
2	**Chapter 2: Human Rights in India** **Protection of Human Rights Act, 1993:** Analyze the key features and provisions of this legislation. **Third Generation Human Rights (Group Rights) and Fourth Generation Human Rights (Right to Development and Environmental Rights):** Explore emerging categories of human rights, emphasizing group rights, right to development, and environmental rights. **Convention on the Elimination of All Forms of Discrimination Against**	10	CO2	As per individual faculty discretion	Understand	As per individual faculty discretion

	Women (CEDAW): Discuss the international convention focused on women's rights. Indian Laws related to women and children - Dowry Prohibition Act , PWDVACT ,POCSO Act **Convention on the Rights of the Child:** Examine the international convention addressing the rights of children.					
3	**Chapter 3: Enforcement of Human Rights** **National Human Rights Commission (NHRC):** Analyze the role, functions, and significance of the NHRC in India. **State Human Rights Commission:** Explore the functions and role of State Human Rights Commissions in India. **Judicial Activism and Human Rights:** Discuss instances of judicial activism in upholding human rights and the impact on legal interpretation. **Human Rights Courts in India:** Examine the establishment and functioning of specialized courts dedicated to human rights issues.	10	CO3	Lecture with PPTs Case Study	Analyse	As per individual faculty discretion

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Charles R. Beitz	The Idea of Human Rights	2009	Oxford
2	Amartya Sen	The Argumentative Indian	2006	Penguin

Online Resources

Online Resources No.	Website address
1	https://www.who.int/
2	https://www.icrc.org/en

MOOCs:

Resources No.	Website address
1	Alisons
2	Swayam

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VI	**601**	**Data Warehousing And Data Mining**	
	Prepared by	**Dr.Rajendra Pujari**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

- To identify the scope and essentiality of Data Warehousing and Mining.
- To analyze data, choose relevant models and algorithms for respective applications.
- To study spatial and web data mining.
- To develop research interest towards advances in data mining.

Course Outcomes :

After completing this course, the student will be able to :
CO1 : Identify the need for data warehousing
CO2 : Understand the data warehousing architecture and understand various of Data warehouse.
CO3: Familiar with basic concepts of data mining
CO4 : Applying knowledge using association rule mining algorithms, classification techniques and prediction methods in real life applications

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Data warehousing:** Data Warehousing, Difference between operational database system and data warehouse, Data Warehouse Users, Benefits of Data Warehousing, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two Tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema. OLAP, Need for OLAP, OLAP Operations, OLAP Models.	8	CO 1	Lecture with Ppts Quiz	Understand	End Term Internals :Short Answers

2	**Data Preprocessing:** Need, Objectives and Techniques, Descriptive data summarization, Data Cleaning, Data Integration, Data Transformation, Data Reduction.	8	CO 1	Lecture with Ppts	Apply (Analyse)	End Term Internals :Short Answers
3	**Introduction to Data Mining:** Introduction, Need for Data Mining, KDD Process, Data Mining Architecture, Data Mining Functionalities, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System	8	CO 3	Lecture with PPTs	Analyse	End Term Internals :Short Answers , Viva
4	**Mining Frequent Items and Associations:** Frequent Item Set, Closed Item Set, Association Rule Mining, Market Basket Analysis, Classification of Association Rules, Apriori Algorithm	6	CO1	Lectures with PPTs	Evaluate	End Term Internals :Short Answers , Practice examples
5	**Classification and Prediction:** Classification & Prediction, Issues regarding classification & Prediction, Comparing Classification Methods, Classification by Decision Tree Induction	7	CO2	Lecture Case Activity	Create	End Term Internals :Short Answers
6	**Clustering:** Introduction, Cluster Analysis, Need, Categorization of Major clustering methods. Types of Data in Cluster Analysis, Partitioning Methods: K-Means Method, K-Mediods Method, Applications of data mining in various sectors	8	CO4	Lectures with PPTs	Evaluate	End Term Internals :Short Answers

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Jiawei Han and Micheline Kamber	Data Mining Concepts and Techniques	2012	ELSEVIER
2	M.Humphires, M.Hawkins	Data Warehousing: Architecture and Implementation	2008	Pearson Education
3	Kargupta, Joshi	Data Mining: Next Generation Challenges and Future Directions	2004	Prentice Hall of India
4	Margaret H.Dunham	Data mining Introductory and advanced Topics	20018	Pearson Education

MOOCs:

Resources No.	Web site address
1	NPTEL / Swayam
2	www. edx.com
3	www.coursera.com

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VI	**602**	**Web Programming(PHP)**	
	Prepared by	**Dr.Suvarna Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

- To get knowledge of dynamic web site development
- To make students able to design, develop the various types of web based applications.
- To get student familiar with various functionality of PHP

Course Outcomes :

CO1: To study the basic of PHP language as control structures , array , function, strings and file handling

CO2: To understand the concept of cookie and session

CO3: To under the MYSQL components, and Database connectivity

CO4: To create website with implementation of all concepts

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Introduction To PHP:** Installing and configuring PHP, Building blocks of PHP:PHP tags, variables, data types, operators, expressions, constants, Control Structures: conditional statements, loops, switch statement	9	CO 1	Lecture with Ppts	Understand	Quiz Short Answers
2	**Working With Functions And Arrays:** Working with functions: What is a function? Function declaration and definition, Calling function, user defined functions, variable scope, working with arrays: Creating, sorting and reordering arrays, PHP classes.	9	CO 1	Lecture with Ppts	Understand	Quiz Short Answers

3	**String Manipulation:** Working with strings, dates and time: Formatting, investigating and manipulating strings with PHP, using date and time functions in PHP, working with forms: Creating a simple input form. File Handling: Saving data, storing and retrieving Bob's order, processing files, opening file, writing to a file, closing a file, reading from a file, uses other useful file functions	9	CO 1	Lecture with Ppts	Understand, Apply	Quiz Short Answers
4	**Working With CookiesAnd Sessions :** Working with cookies: Introducing cookies, setting and deleting cookies with PHP Working with session: starting a session, working with session variables, passing session IDs in the query string, destroying sessions and unsetting variables, using sessions	9	CO2	Lecture with Ppts	Understand, Apply	Quiz Short Answers
5	**MYSQL :** Creating web database: Using MySQL monitor, logging into MySQL, creating databases and users, setting users and privileges, column data types **Working with MySQL database**: Inserting data into database, retrieving data from the database, retrieving data with specific criteria, retrieving data from multiple tables, retrieving data in particular order, grouping and aggregate data, using	9	CO3, CO4	Lecture with Ppts	Create, Apply	Quiz Short Answers

	sub queries, updatingrecords, deleting records from databases, dropping table and database.					

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Welling Thomson	PHP and MySQL Web Development	Fourth Edition	Pearson Publication
2	Julie C. Meloni	Teach Yourself PHP, MySQL and Apache	12th edition	Pearson Publication

Online Resources

Online Resources No.	Web site address
1	https://www.tutorialspoint.com/php/index.htm
2	https://www.w3schools.com/php/
3	https://www.javatpoint.com/php-tutorial

MOOCs:

Resources No.	Web site address
1	NPTEL / Swayam
2	www. edx.com
3	www.coursera.com

Programme: BCA CBCS–Revised Syllabus w.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
VI	**603**	**Software Project Management**	
	Prepared by	**Mr.B.D.Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

CourseObjectives:

- To provide basic project management skills with a strong emphasis on issues
- To understand problems associated with delivering successful IT projects
- To understand of the particular issues encountered in handling IT projects
- To offer students methods, techniques to manage IT projects
- To provide 'hands-on' experience in dealing with IT projects

Course Outcomes:

CO1: Remember basic concept of software, types, SDLC, Process models

CO2: By remembering basic concept of software student will understand concept of projectmanagement formulation, project management

CO3: Student will have thorough knowledge of software project management life cycle and apply upto real life project

CO4: Student will acquire a good knowledge of software project management, PMBOK, accuratesoftware estimation, risk and software quality.

CO5: Student will have ability to make estimation and planning and scheduling of real life project

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	**Introduction to project management:** Project, project management, Importance, characteristics of project how software projects are diff. than other projects, Problems with software projects, Phases: Initiation phase, planning phase, execution phase, monitoring and controlling phase, and closing phase. All parties involved in project, Role of	5	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers

	Project Manager, Project management framework, Software tool for project Management					
2	**Project planning:** Integration management: What is integration management, plan development and execution, What is scope management, methods for selecting project, scope statement, Work Breakdown Structure, main steps in Project planning: identify project scope and objective, identify project infrastructure, analyze project characteristics, identify project products and activities, estimate effort for each activity, identify risk activity, allocate resources, review plan, execute plan. Use of software (Microsoft Project) to assist in project planning activities.	10	CO 2	Lecture with Ppts Case Study Microsoft Project Demo	Apply (Analyse)	Case Study , Business cases End Term: Applied Questions
3	**Project scheduling:** Time management: importance of Project schedules, schedules and activities, sequencing and scheduling activities, Network Planning models, duration estimation and schedule development, Critical path analysis, PERT, Gantt charts Use of software(Microsoft project) to assist in project scheduling.	10	CO 3	Lecture with PPTs Case Study Microsoft Project Demo	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Project cost management:** Importance and principles of project cost management, Resource planning, Attributes to be considered in cost estimation, factors affecting the cost, various costs involved in it. Traditional method: Estimation by analogy, Expert judgment, Parkinson, price to win, top down,	10	CO 4	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short business cases and situation based questions

	bottom up. COCOMO Model, Function point analysis, Function point analysis, Cost control, Use of software(Microsoft project) to assist in cost management.					
5	**Project quality management and Project Risk Management:** Quality of information technology project, Stages of software quality management, PMBOK, Quality standards, Tools and techniques for quality control. **Project risk management:** The importance, Top risk in projects, Common sources of risk in IT projects, elements in risk mgt., Risk identification, Risk quantification, Risk response development and control, using software to assist in project risk management.	10	CO 5	Lecture, Case Activity	Analyze / Evaluate	Case Presentation Activity End Term: Theory Applied Questions

Reference Books

Sr.No.	Name of the Author	Titleof the Book	Publisher Company
1	Kathy schwalbe,	Information Technology Project Management: THOMSON	course Technology, 2003.
2	Bob Hughes and Mike Cottrell,	Software project management Third edition	Tata McGraw-Hill
3	Microsoft project Tool.	Software Requirement:	Microsoft project Tool.

Online Resources:

Online ResourcesNo	Websiteaddress
1	https://onlinecourses.swayam2.ac.in
2	https://www.coursera.org/courses
3	https://www.udemy.com/courses
4	https://www.edx.org
5	NPTEL / Swayam
6	https://www.classcentral.com

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VI	**605**	**Lab on Web programming with Project**	
	Prepared by	**Dr.Suvarna Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	UE:IE	60:40

Course Objectives:

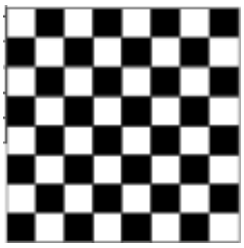
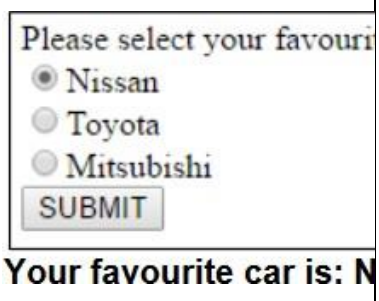
To make students to:

- To get knowledge of dynamic web site development
- To make students able to design, develop the various types of web based applications.
- To get student familiar with various functionality of PHP

Course Outcomes :

CO1: To apply concept of array, looping, function,, file handling, string function
CO2: To create form with basic functionality
CO3: To create Database and Tables with SQL and create Database connectivity
CO4: To create website with implementation of all concepts

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	EvaluationTools
1	Write a Program for finding the biggest number in an array without using any array functions. Write a program to square of a number. Write a program to print Factorial of any number. Write a program in PHP to print Fibonacci series.	5	CO 1	Practical Demo	Create	Quiz

	Write a program to find whether a number is Armstrong or not. Write a program to find HCF of two numbers					
2	Write a program to demonstrate four built in functions.	1	CO 1	Practical Demo	Apply	Quiz
3	Program to print the below format *	1	CO1	Practical Demo	Create	Quiz
4	Write a program to make a chess: 	2	CO1	Practical Demo	Create	Quiz
5	Create the following form and based on the user selection print a message in the format given below:  	10	CO2	Practical Demo	Create	Quiz

	• Write a PHP program to create and manage a database using SQL commands. • Write a PHP program to create and validate a email id. • Using PHP and SQL, create and validate a sample login form. • Write a PHP script to accept personal details of student (rno, name, class) on first page. On second pageaccept marks of six subjects (out of100). On third page print marklist (rno, name, class, marks, total, percentage) • Write a PHP file that will output a form containing 2 fields: username and password. Upon submission of the form, the code should check against the database to see whether the username-password pair was correct. If so, display a welcome message. If not, display the message "Invalid username or password" followed by the same login form.	6	CO2,CO3	Practical Demo	Create	Quiz
	Write a PHP file that can be added to other PHP files usin	5	CO4	Practical Demo	Create	Quiz

	the include or require functions. This file should: a. Make a connection to a MySQL database, and log in with valid credentials. The connection resource should b stored in a variable with an appropriate name. b. Create a database TEST if it does not exist. c. Select the TEST database. d. Create a table USER exerciseusers if it does not exist with the following field i. USERNAME VARCHAR(100) , PASSWORD_HASH CHAR(40), PHONE VARCHAR(10) e. The USERNAME field should be designated as UNIQUE. f. If any of these operations cause an error, stopexecution and print the error message Design a web page that accepts inputs(username and password) and authenticate the username and password from a given database using PHP.					

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Welling Thomson	PHP and MySQL Web Development	Fourth Edition	Pearson Publication
2	Julie C. Meloni	Teach Yourself PHP, MySQL and Apache	12th edition	Pearson Publication

Online Resources

Online Resources No.	Web site address
1	https://www.tutorialspoint.com/php/index.htm
2	https://www.w3schools.com/php/
3	https://www.javatpoint.com/php-tutorial

MOOCs:

Resources No.	Web site address
1	NPTEL
2	Swayam
3	edx.com
4	coursera.com

Programme: BCA CBCS – Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VI	**606**	**Lab on Data Visualization**	
	Prepared by	**Prof. Niket Tajane**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	2	UE:IE	60:40

Course Objectives:

- Introduce the basic concepts of Statistics and Data Visualization techniques.
- Explore the types of data visualization by using small as well as large datasets.
- To present the result using various visualization techniques by using Python.

Course Outcomes :

After completing the course, the students shall be able to:

CO1 :To comprehend how Statistics techniques are used.

CO2 :To comprehend how data visualization techniques are used.

CO3 :To apply different forms of visual encoding and data visualization.

CO4 :Students can demonstrate various methods of data visualization to present the relevant analysis's outcome by using python programming after solving case study.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Basic statistical operations** Apply basic statistical operations on a dataset. For example - compute the mean, median, mode, range, quartiles, and variance for one or more attributes. a. Create a dataframefor students' information such name, graduation percentage and age.	5	CO 1	Lab Demonstration / Practical Assignments	Understand and Applying	Short answer

	Display average age of students, average of graduation percentage. And, also describe all basic statistics of data. (Hint: use describe ()). b. Download iris dataset file. Read this csv file using read_csv() function. Take samples from entire dataset. Display maximum and minimum values of all numeric attributes. c. Continue with above dataset, find number of records for each distinct value of class attribute. Consider entire dataset and not the samples. Display column-wise mean, and median for iris dataset from (Hint: Use mean() and median() functions of pandas Dataframe					
2	**Introduction to Python** **a.** Download the heights and weights dataset and load the dataset from a given csv file into a dataframe. Print the first, last 10 rows and random 20 rows. (https://www.kaggle.com/burnoutminer/heightsand-weights-dataset) **b.** Write a Python program to find the shape, size, datatypes of the dataframe object.	5	CO 2, CO3	Lab Demonstration / Practical Assignments	Understand and Applying	Short answer

<table>
<tr>
<td></td>
<td>
c. Write a Python program to view basic statistical details of the data.
d. Write a Python program to get the number of observations, missing values and nan values.
e. Write a Python program to add a column to the dataframe “BMI” which is calculated as : weight/height2
</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>
Basic of DataVisualization
Create the Data set as perthe following table in .csv file and draw thefollowing types of Graph / Charts. Use Matplotlib Library.
<table>
<tr><th></th><th>total_bill</th><th>tip</th><th>sex</th><th>smoker</th><th>day</th><th>time</th><th>size</th></tr>
<tr><td>0</td><td>16.99</td><td>1.01</td><td>Female</td><td>No</td><td>Sun</td><td>Dinner</td><td>2</td></tr>
<tr><td>1</td><td>10.34</td><td>1.66</td><td>Male</td><td>No</td><td>Sun</td><td>Dinner</td><td>3</td></tr>
<tr><td>2</td><td>21.01</td><td>3.50</td><td>Male</td><td>No</td><td>Sun</td><td>Dinner</td><td>3</td></tr>
<tr><td>3</td><td>23.68</td><td>3.31</td><td>Male</td><td>No</td><td>Sun</td><td>Dinner</td><td>2</td></tr>
<tr><td>4</td><td>24.59</td><td>3.61</td><td>Female</td><td>No</td><td>Sun</td><td>Dinner</td><td>4</td></tr>
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<tr><td>8</td><td>15.04</td><td>1.96</td><td>Male</td><td>No</td><td>Sun</td><td>Dinner</td><td>2</td></tr>
<tr><td>9</td><td>14.78</td><td>3.23</td><td>Male</td><td>No</td><td>Sun</td><td>Dinner</td><td>2</td></tr>
</table>
a. Scatter Plot
b. Line Chart
c. Bar Chart
Histogram
Seaborn for visualizations (pairplot, heatmap
</td>
<td>8</td>
<td>CO 3</td>
<td>Lab Demonstration / Practical Assignments</td>
<td>Understand and Applying</td>
<td>Short answer</td>
</tr>
</table>

4	**Case Study on Data Visualization** Student must use Iris flower data set for LabAssignments. The Iris flower data set or Fisher's Iris data set is a multivariate data set introduced by the British statistician and biologist Ronald Fisher in his 1936 paper.  The data set consists of 50 samples from each of three species of Iris (Iris setosa, Iris virginica and Iris versicolor). Four features were measured from each sample: the length and the width of the sepals and petals, in centimeters. Based on the combination of these fourfeatures, Fisher developed a linear discriminant model to distinguish the species from each other. The downloadable dataset (.csv format) can be found at:	12	CO2, CO3, CO4	Lab Demonstration / Practical Assignments / Case Study Solving	Understand and Applying	Short answer

	https://archive.ics.uci.edu/ml/datasets/iris a. Generate a random array of 50 integers and display them using a line chart, scatter plot, histogram and box plot. Apply appropriate color, labels and styling options. b. Add two outliers to the above data and display the box plot. c. Create two lists, one representing subject names and the other representing marks obtained in those subjects. Display the data in a pie chart and bar chart. d. Write a Python program to create a Bar plot to get the frequency of the three species of the Iris data. e. Write a Python program to create a Pie plot to get the frequency of the three species of the Iris data. f. Write a Python program to create a histogram of the three species of the Iris data. g. Write a Python program to create a graph to find relationship between the petal length and petal width. h. Write a Python program to draw scatter plots to					

	compare two features of the iris dataset. Write a Python program to create box plots to see how each feature i.e. Sepal Length, Sepal Width, Petal Length, Petal Width are distributed across the three species.					

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Vijay Kotu and Bela Deshpande	Data Science Concepts and Practice	2nd Edition	Morgan Kaufmann Publisher
2	Field Cady	The Data Science Handbook	1st Edition	John Wiley & Sons
3	Chun-houh Chen, Wolfgang Härdle, Antony Unwin	Handbook of Data Visualization	1st Edition	Springer

Online Resources

Online Resources No.	Web site address
1	(https://www.kaggle.com/burnoutminer/heightsand-weights-dataset)
2	https://archive.ics.uci.edu/ml/datasets/iris

MOOCs:

Resources No.	Web site address
1	NPTEL/ Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS – Revised Syllabus w.e.f – 2022-2023			
Semester	**Course Code**	**Course Title**	
VI	**607**	**Digital Marketing**	
	Prepared by	**Dr.Pratap Desai**	
Type	**Credits**	**Evaluation**	**Marks**
SEC	02	IE	50

Course Objectives:

1. Gain a comprehensive understanding of the core concepts and channels of digital marketing and its strategic significance in contemporary business.
2. Develop practical skills in search engine optimization (SEO) to optimize websites, conduct keyword research, and implement on-page and off-page strategies.
3. Learn to create and implement engaging social media marketing strategies, including content creation, audience engagement, and effective use of social media advertising.
4. Acquire proficiency in using digital marketing analytics tools to interpret data, measure campaign success, and make data-driven decisions for optimization.
5. Learn the planning and execution of digital advertising campaigns across platforms like Google Ads and Facebook Ads,

Course Learning Outcomes:

CO 1. Students will demonstrate a comprehensive understanding of the fundamental concepts, principles, and components of digital marketing,.
CO 2. Students will develop the ability to analyze and interpret digital marketing data using analytical tools and metrics
CO 3. Students will be proficient in developing and executing content marketing strategies and will demonstrate the skills needed to create compelling and relevant content for various digital platforms
CO 4. Students will acquire expertise in utilizing social media platforms for marketing purposes and will create and execute social media campaigns
CO 5. Students will be capable of planning, designing, and executing digital advertising campaigns across various channels such as Google Ads, Facebook Ads, and other display networks.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Digital Marketing Fundamentals**1.Definition and scope of digital marketing 2.Historical perspective and evolution3.Impact on traditional marketing 4.Major digital marketing channels (SEO, SEM, SMM, Email Marketing) 5.Comparative analysis of channels 6.Case studies of successful digital campaigns 7. Digital Marketing Strategy	9	CO1, CO2	Lectures, Experts form Industry Case study	Understanding Remembering Planning	Quiz Class test

	8. Setting objectives and goals 9. Target audience identification 10. Developing a digital marketing plan					
2	**Search Engine Optimization (SEO) and Search Engine Marketing (SEM)** 1.Understanding search engines and algorithms 2.On-page and off-page optimization techniques 3.SEO best practices 4.Using tools like Google Analytics and Search Console 5.Keyword research and analysis 6. Monitoring website performance 7.Overview of search engine marketing 8. Basics of pay-per-click advertising 9. Campaign setup and management Keyword selection and bidding strategies 10.Ad copywriting and design 11. Budgeting and ROI measurement	10	CO3	Lectures Case Studies Group Discussion DM Plan Development	Understanding Implying Analysing	Class Test Online Quiz Group Discussion
3	**Social Media Marketing (SMM), Email Marketing, and Analytics** 1.Overview of major social media platforms 2.Building a social media strategy 3.Creating engaging content 4.Visual storytelling and multimedia strategies 5.Social media scheduling and management tools 6. Paid advertising on social platforms Analytics and performance measurement 7. Email Marketing, Content Marketing, and Analytics 8.Building email lists and segmentation 9.Designing effective email campaigns 10. Automation and personalization 11.Content strategy and planning 12. Measurement and optimization	12	CO4 CO5	Lectures Case studies Presentation Evaluation Field Visits Content Writing	Creating Evaluating	Online Tests Internship Dummy Campaigns Peer Review Digital Assessment

	13. Performance Measurement Importance of data-driven decision-making 14. Key metrics in digital marketing Analyzing and interpreting analytics data					

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition:	Publisher Company
1	Mathur, Vibha, Arora, Saloni	Digital Marketing		PHI Learning
2	Vandana Ahuja	Digital Marketing	1st Edition	Oxford University Press
3	Dr Tanvi Gupta Dr Smita Mishra Ms Kaushi Katyal	A text book on Digital Marketing	2nd Edition	Puffins Publishers
4	Seema Gupta	Digital marketing	3rd Edition	Mc Graw Hill

Online Resources:

Online Resources	Website address
1	https://india.oup.com/product/digital-marketing-2e-9789354972478?
2	https://kamarajcollege.ac.in/wp-content/uploads/Core-14-Digital-Marketing.pdf
3	https://tech-vismera.myinstamojo.com/product/2868999/digital-marketing-study-material/

MOOC:

MOOCS	Website address
1	https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/269
2	https://soravjain.com/digital-marketing-course-for-free/
3	https://www.socialbeat.in/top-free-digital-marketing-courses-online-in-india/
4	https://onlinecourses.swayam2.ac.in/ugc19_hs26/preview

Programme:BCA CBCS – Revised Syllabus w.e.f. - Year 2022 – 23			
Semester	**CourseCode**	**Course**	
VI	**608**	**Indian Culture**	
	Prepared by	Dr Mona Sinha	
Type	**Credits**	**Evaluation**	**Marks**
AEC	2	IE	50

CourseObjectives:

- To acquaint students with the Cultural History of India
- To Understand various phases in and the process of the evolution of Indian Culture
- Review of the Theoretical framework of the evolution of Indian Languages and literature

Course Outcomes:

CO1: Understand various phases in the evolution of Indian Culture and appreciate the glorious Past and achievements of Indians.

CO2: Students should know about Vedas, Indian philosophy and Religion.

CO3: It allows students from a variety of disciplines to gain a comprehensive grasp of the core principles of Indian Culture.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Indian Culture: An Introduction** 1. Characteristics of Indian culture, Significance of Geography on Indian Culture. 2. Society in India through ages- Ancient period- Varna and Jati, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism. 3. Religion and Philosophy in India: Ancient Period: Pre-Vedic and Vedic Religion, Buddhism and Jainism, Indian philosophy – Vedanta and Mimamsa school of Philosophy.	8	CO1	lectures, ppts	Understand	quiz
2	**Indian Literature** 1. Short History of the Sanskrit literature: The Vedas, The Brahmanas and Upanishads & Sutras, Epics: Ramayana and Mahabharata & Puranas.	8	CO2	lectures, ppts , stories, class presentations	Analyze	class discussion

	2. History of Buddhist and Jain Literature in Pali, Prakrit and Sanskrit, Sangama literature & Odia literature.					
3	**A Brief History of Indian Arts and Architecture** 1. Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture. **2.Performing Arts**: Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.	6	CO3	Lectures with PPTs Flip Classroom	Analyze	class test
4	Field Visit is Compulsory to one of the Following Sites. This should be followed by the submission of the Report on the given assignment**.** **Field Visits** 1.'Discovery of India' Exhibition at Nehru Centre, Worli, Mumbai 2. Deccan College PGRI Deemed University Museum, Pune. 3.Chatrapati Shivaji Maharaj Vastu Sangrahalaya, Mumbai.	8	CO3	Demo	Analyze	Presentation

Reference Books:

Sr. No.	Name of the Author	Titleof the Book	Year Edition	Publisher Company
1	J.L.Mehta, Sarita mehta	History of Ancient India	2012	
2	Shastri K. A. Nilakanth	History of India Part I – Ancient India		
3	R.C.Majumdar, H.C. Raychaudhari, Kalikinkar	An Advanced History of India	2020	

4	Kosambi D. D.	The culture and civilization of ancient India	1975	
5	Kosambi D. D.	An introduction to study of Indian History 1975	1975	
6	Sharma R. S.	Aspect of political ideas and institution in ancient India	1959	

Online Resources:

Online ResourcesNo	Website address
1	https://www.researchgate.net/publication/339726396_A_Brief_History_of_India
2	https://www.pdfdrive.com/indian-history-books.html

MOOCs:

Resources No	Web site address
1	https://www.edx.org/course/natural-disasters
2	https://swayam.gov.in/
3	https://www.coursera.org/
4	https://nptel.ac.in/

Programme: BCA CBCS Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
VII	701	Introduction to AI and ML	
	Prepared by	Dr.M.K.Patil	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE: IE	60:40

Course Objectives

- The aim of the Artificial Intelligence & Machine Learning course is to prepare students for a career in computer science & and engineering where knowledge of AI & ML techniques leads to the advancement of research and technology.

Course Outcome

CO1: Demonstrate a fundamental understanding of artificial intelligence (AI) and expert systems.

CO2: Apply basic principles of AI in solutions that require problem-solving, inference, perception, knowledge representation, and learning.

CO3: Demonstrate proficiency in applying scientific methods to models of machine learning.

CO4: Discuss the basics of ANN and different optimization techniques.

CO5: Design and Concrete implementations of various machine learning algorithms to solve a given problem using languages such as Python

nit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Overview and Search Techniques	Introduction toAI, Problem Solving, State space search, Blind search: Depth- first search, Breadth-first search, Informed Search: Heuristic function, Hill climbing search, best-first search, A* & AO* Search, Constraint satisfaction, Mini-Max search, Alpha-beta pruning	10	CO1 CO2	Classroom Teaching, Presentations, Video Demo	Understand, apply (Analyze)	Quiz End Term Internals: Short Answers
Knowledge Representation (KR)	Introduction to KR, Predicate logic, Inference rule & and theorem proving, forward chaining, backward chaining, resolution; Propositional knowledge, Rule-Based Systems, Forward reasoning: Conflict resolution, backward reasoning: Structured KR: Semantic Net, slots, inheritance, Conceptual Dependency.	10	CO2	Classroom Teaching, Presentations, Case study	Apply (Analyze)	Case Study, End Term: Applied Questions
Handling uncertainty	inference, Bayes' theorem, Limitation of naïve Bayesian system, Bayesian Belief Network (BBN)					Exams: Case-based Questions/Applied Questions

Artificial Neural Networks	Introduction, Artificial Neurons, Perceptron, Multilayer Networks, Back-propagation Rule back-propagation Algorithm-	9	CO4	Classroom Teaching, Presentations, Video Demo	Create, Evaluate	Case Presentation Activity End Term: Theory Applied

Reference Book:

Sr. No.	Name of the Author	Title of the Book	Publisher Company
1	Elaine Rich and Kevin Knight	Artificial Intelligence	Tata McGraw Hill
2	Shai Shalev-Shwartz and Shai Ben-David	Understanding Machine Learning	Cambridge University Press
3	B. Yegnanarayana	Artificial Neural Network	CRC Press, Taylor& Francis group,2010
4	Tom Mitchell	Machine Learning	Tata Mc Graw Hill edition,2010
5	E. Alpaydin	Introduction to Machine Learning",	PHI, 2005.
6	Christopher M. Bishop	Pattern Recognition and Machine Learning (Springer)	
7	Dan W. Patterson,	Introduction to Artificial Intelligence and Expert Systems	Prentice Hall of India
8	Andrew Ng	Machine learning yearning	https://www.deeplearning.ai/machine-learning-yearning
9	Aurolien Geron	Hands-On Machine Learning with Scikit-Learn and TensorFlow	Shroff/O'Reilly", 2017
10	Andreas Muller and Sarah Guido	Introduction to Machine Learning with Python: A Guide for Data Scientists	Shroff/O'Reilly, 2016

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VII	**702**	**Object Oriented Analysis & Design**	
	Prepared by	**Dr.Swati Desai**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

Course Objective :

1. To understand system development through object oriented techniques.
2. Students should be able to apply object oriented concepts and UML diagrams to the defined problem.
3. Students should be able to understand requirements of the user.
4. Students should be able to evaluate design of the existing software.

Course Outcomes :

At the end of course students will know –

CO1: Various steps carried out in development of software.
CO2: Object oriented concepts and UML diagrams to the defined problem
CO3: How to analyze requirements of the user and convert to functionalities of the software.
CO4: How to design their own software.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	Object Oriented Concepts, Modeling and UML: What is Object Orientation : (Introduction to class, object, inheritance, polymorphism), Model : Introduction of Modeling, Object Oriented Modeling , Object oriented system development: Function/data methods, Object oriented analysis, Object oriented construction, Object oriented testing	6	CO1	Lecture with Ppts, Q/A,Discussion	Understanding	Assignment

2	Iterative Development and UML:Understanding requirements, Rational Unified process &RUP Phases – Inception, Elaboration,Construction, Transition UML : Designing Tool for OOAD : Introduction to UML, Overview of UML, Conceptual Model of UML, Diagrams in UML, Advantages of UMLBehavioral Modeling Use Case Diagram : Realization of Use Cases, Finding Actors, Defining Relations among Use case, Writing Use Cases, Activity Diagram	8	CO2	Lecture with Ppts, Demo, Lab Sessions	Understanding, Analyzing & creating	Theory& Practical assignments/scenario to design Use of Tool
3	Basic and Advanced Structural Modeling Class Diagram : Identifying the elements of an object model, Identifying classes and objects, Specifying the attributes, Defining operations, Finalizing the object definition, Advanced class Modelling, Interface, Types and Roles Diagrams Based on Classes : State Chart Diagram, Package Diagram, Object Diagram	8	CO2	Lecture with Ppts, Demo	Understanding, Analyzing & creating	Theory & Practical assignments Use of Tool
4	Interaction Modelling : Introduction to Interaction Diagrams, Need of Interaction Diagrams, Interaction Diagrams, Collaboration Diagram, Sequence Diagram	7	CO2	Lecture with Ppts, Demo	Understanding, Analyzing & creating	Theory & Practical assignments Use of Tool

5	Architectural Modeling Component Diagram: Need of Component Diagram, Realization of Components, Relating Components. Deployment Diagram : Purpose of deployment diagram, Architecture of System, Different Architectures used for System, Representing Architecture using Deployment Diagram	7	CO4	Lecture with Ppts, Demo	Understanding, Analyzing & creating	Theory & Practical assignments Use of Tool
6	Extensibility, Robustness, 3 Programming in the Large, Discussion on case Studies e.g. Library Management System, Hospital Management System, . Online Shopping, Nukari.com website, Matrimonial website				creating	Use of Tool

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Grady Booch, James Raumbaugh, Ivar Jacobson.	The Unified Modeling Language User Guide	-	Addison-Wesley professional
2	Ivar Jacobson	Object Oriented Software Engineering Use case driven approach	-	Pearson
3	Martin Fowler	UML Distilled	-	Addison-Wesley Professional

Online Resources

Online Resources No.	Web site address
1	https://www.tutorialspoint.com
2	https://www.javatpoint.com/uml
3	https://www.guru99.com/uml-tutorial.html
4	https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/

MOOCs:

Resources No.	Web site address
1	Swayam
2	NPTEL

Programme:BBA CBCS–Revised Syllabus w.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
VII	**703**	**Research Methodology**	
Prepared By		**Dr. Bajirao Patil_YMIM**	
Type of Course	**Credits**	**Evaluation**	**Marks**
MDC	**03**	**IE:UE**	**40:60**

Course Outcomes:

CO1: Develop understanding on various applications of research for managerial decision making

CO2: Explain key research and summarize the research articles and research reports

CO3: Have basic awareness of data analysis-and hypothesis testing procedures

CO4: Design questionnaires and administer simple survey based projects

CO5: Describe sampling methods, measurement scales and instruments, and appropriate uses of each

Unit	Sub units	Sessions	COs No.	Teaching Methodology	Cognition level	Evaluation Tools
1	**Introduction to Research Methodology** Meaning, definition and objectives of research, motivations for research, types of research, Importance of research in managerial decision making, research in Research in functional / business areas. Qualities of a good researcher.	9	CO 1	Lecture with Ppts. Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Research Process** Steps in research process, Defining the research problem, Problem formulation and statement, Framing of hypothesis Research design : Meaning, characteristics, importance of research design. Development and designing of tools of data collection Designing of research projects – research proposal.	10	CO 2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied Questions

3	**Sampling and Data Collection** Census and sample survey. Need and importance of sampling, Data collection – Primary and secondary sources of data, methods of collecting primary data - interview, observation, questionnaires, schedules through enumerators, surveys. Advantages and Limitations of different methods of data collection. Use of secondary data, precautions while using secondary data.	8	CO3	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Processing and Analysis of Data** Meaning, importance and steps involved in processing of data. Statistical tools and techniques for analysis of data Analysis and Interpretation of data –Interpretations of results, Concept of Univariate, Bi-variate and multivariate analysis of data.	9	CO4	Lectures with PPTs Group Activity Video Cases	Understand	Group Activity End Term Exam: Short case and situation based questions
5	**Report Writing** Importance of research reports, types of reports, Format of a research report, Precautions in writing a research report. Plagiarism and its types. References and Bibliography. Dissemination of research results. Ethical issues in conducting research.	9	CO5	Lecture Case Activity	Apply (Analyse)	Case Presentation Activity End Term: Theory Applied

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year of Edition	Publisher
1	Kothari C R	Research Methodology –Methods & Techniques	2014	PHI Pvt Ltd New Delhi
2	Uma Sekharan	Research Methods for business	2016	Oxford
3	Ranjit Kumar	Research Methodology	2009	Pearson Education
4	Donald Cooper and PS Schindler	Business Research Methods	2015	Tata McGraw Hill
5	Neuman, W.L.	Social Researhc Methods – Qualitative and Quantitative	2008	Pearson

Online Resources:

Online Resource No.	Website address
1	https://www.manaraa.com/upload/43ef7b58-5c8a-4371-8aea-699609cd2aaf.pdf
2	http://ebooks.lpude.in/commerce/mcom/term_2/dcom408_dmgt404_research_methodol ogy.pdf
3	https://www.methodspace.com/open-access-sage-journals-with-a-research-methods-focus/
4	https://www.researchgate.net/deref/https%3a%2f%2fwww.amazon.com%2fhow-research-todays- tips-tools-ebook%2fdp%2fb01i5jjdxc http://www.ala.org/tools/research/larks/researchmethods
5	https://www.intechopen.com/online-first/research-design-and-methodology
6	https://lecturenotes.in/m/21513-research-methodology-

MOOCs:

Resource No.	Website address
1	https://swayam.gov.in/nd2_cec20_hs17/preview
2	https://www.classcentral.com/course/researchmethods-1767
3	https://www.coursera.org/learn/research-methods

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VII	**705-Mobile Application Development with Lab**		
	Prepared by Dr. Rahul Jadhav		
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	UE:IE	60:40

Course Objectives:

- To understand architecture of mobile application using Android
- To get acquainted with life cycle of android application and its component
- To develop proficiency in creating Mobile based applications using the JavaProgramming Language.
- To develop application using android with data handling(database access)

Course Outcomes:

At the end of this course, student should be able to understand

CO1: State features of Android, components of android architecture and android application.

CO2: Describe components of android application along with life cycle of activity, intent, fragment etc.

CO3: Apply android knowledge to design and develop mobile applications

CO4: Analyse the use of Intent, Fragment, content providers and sensors.

CO5: Evaluate use of various component of android application.

CO6: Create and publish Android application using various component and database.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
1	**Introduction to Android** Android OS, evolution and advantages of android, Dalvik VirtualMachine, Features of Android, API Level Introduction, Linux Kernel, Libraries, Android Libraries, Android Application Framework, Introduction to Application components.	4	CO1, CO2	Lecture withPPT	Understand	Quiz
2	Android Studio Downloading and installing Android Studio, Android StudioOverview, Creating a first project (HelloWorld), Understanding Project internals and configuration files. Creating and Launching emulator(Android Virtual Device), Editing emulator settings, Running first android application on emulator **Practical:**	4	CO2	Lecture withPPT, Hands OnDemo	Understand	Quiz

3	**Working with Activities and Layouts**Android Activities Introduction, Life Cycle, Working with Activities, handling events, making use of resource files, concept of intents and using it tolaunch new activities. UI Layouts, Types of Layout, Configuration of Layouts, View Identification, UI Controls, Event Handling, understanding and usingfragments, Making use of adapters	4	CO 3	Lecture withPPT, Hands OnDemo	Analyze	Class Test, Lab assignment, MidTerm Exam
4	**Content Providers**: Working with Shared Preferences, storing andretrieving shared key- value pairs. tore data using SQLite database, Content Providers, Content Resolver, Loader	4	CO3 , CO6	Lecture withPPT, Hands OnDemo	Evaluate ,Create	Lab Assignment
5	**Intents and Intent Filters** Understanding the Intents, Android Intent Messaging via Intent Objects, Intent Resolution, Intent Filters, Explicit Intents,Implicit Intents, Working with Intents, Using Intents with Activities, Android Services, Using Intents with Broadcast Receivers	4	CO2 , CO4	Lecture withPPT, Hands OnDemo	Evaluate , analyze, Create	Lab Assignemnt
6	**Sensor, Location andMaps** Sensor Basic, Motion and Position Sensors, Using Orientation and Accelerometer sensors Using Location Based Services, Finding	5	CO5	Lecture withPPT, Hands OnDemo	Evaluate , analyze, Create	Class test, End Term Exam, lab Assignment

	current location and listening for changes in location , Proximity alerts, Working with Google Maps, Showing Google map in an Activity, Map Overlays, Itemized overlays, Geocoder, Displaying route on map					
7	**Performance Improvement and Publishing** Performance Parameters, Profiling Tools, Rendering and Layout, Garbage Collection and Memory Leaks, Best Practices. Preparing for publishing ,Signing and preparing the graphics , ublishing to the Android Market	5	CO6	Lecture with PPT, Hands On Demo	Evaluate, analyze, Create	End Term Exam: Mini Project

Practical:

Following is the sample practical assignments. Student has to identify the similar problems andsolve during the practical sessions. Student has to develop minor project based on above syllabus.

Sample questions for Practical

1	Create "hello world" application to display "hello world" in the middle of the screen in the emulator as well as android phone
2	Create an android app to display various android lifecycle phases.
3	Create an android app with first activity having edittext and send button. On click of send button, use explicit intent to send the text within edittext to a second activity and displayed within textview
4	Create an android app with first activity having edittext and send button. On click of send button, use implicit intent that uses send action, and let user select app from app chooser and navigate to that application.
5	Create a calculator app that performs addition, subtraction, division and multilpication operation on numbers.
6	Create a spinner application with strings taken from resource directory res/values/strings.xml and on changing the spinner value, image will change. Image is saved in the drawable directory
7	Create an app that uses radiobutton group which calculates discount on shopping bill amount. Use ediitext to enter bill amount and select one of three radio buttons to determine a discount for 10, 15, or 20 percent.the discount is calculated upon selection of one of the buttons and displayed in a textview control.

8	Create an app that uses radiobutton group of all courses in your college. On selecting one of the buttons, the TIC of that course should be displayed in a textview control at the bottom of the screen.
9	Create an application that uses checkbox for construction of a shopping list so the user can check off items as they are picked up. The checked items should be displayed in a textview control.
10	Create a login application to verify username and password. Create a registration page to register a user. On successful login, "welcome user" should appear as a pop-up message.
11	Create a login application to verify username and password. On successful login, redirect to another activity that has a textview to display "welcome user" with logout button. On click of logout button, a dialog should appear with ok and cancel buttons. On click of oK button, go back to the login activity and on click of cancel button, stay on the same activity.
12	Create a menu with 5 options. The selected option should appear in the textbox.
13	Use linear layout to create a simple application that will take the contents of a predefined textview and use a button to cause the application to take that text, convert it to uppercase, and display it in an edittext field
14	When working with edittext controls on the screen, create an application to respond to a particular keystroke rather than requiring the user to touch a button using keyevent.
15	Create an application that uses tablelayout with textview, edittext and buttons. Also, create ur own styles.xml file within res/values directory, to style text of textview control.
16	Create an application to perform the operations of create, insert, delete, view and update, using sqlite database.
17	Create an app to display 3 button controls vertically aligned. On selecting a button, the color of the screen will change.

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Barry A. Burd	Android Application Development All-in-One For Dummies	August 2015	For Dummies
2	Bryan Sills, Brian Gardner, et al	Android Programming: The Big Nerd Ranch Guide Programming Android	5th edition	Addison-Wesley Professional
3.	J F DiMarzio	Beginning Android Programming with Android Studio	4th Edition 2016	Wiley India Pvt Ltd
4.	Dawn Griffiths and David Griffiths	Head First Android Development: A Brain-Friendly Guide	2nd Edition, 2017	Shroff/O'Reilly

MOOCs:

Resources No.	Web site address
1	https://alison.com/
2	https://nptel.ac.in/courses/106/106/106106147/

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VII	**706**	**Organizational Behavior**	
Type	**Credits**	**Evaluation**	**Marks**
VBC	**1**	**IE**	**50**

Course Objectives:

- To identify and understand the fundamental concepts of Organizational Behavior such as personality, leadership, motivation
- To analyze the interpret the different leadership & motivational theories of OB
- To understand organizational culture and inculcate team behavior.
- To practice Organizational Behavior in virtual environment and ITES companies by having a sound knowledge of individual and cultural differences

Course Outcomes :

- Understand the expected individual and team behavior in business world.
- The awareness of applicable leadership qualities for entrepreneurs / corporate / managers.
- To develop skills and inculcate motivational concepts.
- To be aware of individual, cultural difficulties of organizations and to be ableto master over them.

Unit	Topics	Sessions	CO	Teaching Methodology	Evaluation Tools
1	Introduction to Organizational Behavior – Definition - Features of OB- Challenges and Opportunities for OB managers - Models of OB study	3	1,3	PPT	Class Test Quiz
2	Foundation of Individual Behaviour – Personality- Determinants ; Perception – Process ; Job Satisfaction	3	1,3	PPT	Personality Profiling
3	Motivation – Concept; Maslow‘s' need Theory, Herzberg‘s Two factor theory; Theory X and Theory Y ; Vroom's Expectancy Theory – Application of Motivation concept	3	1,2,3	PPT, Discussion	Class Test Case study
4	Group Behaviour – Formation; types; Managing Virtual Teams	1	1,4	PPT, Discussion	Class Test
5	Leadership – Concept, Leadership Styles Transactional & Transformational Leadership	2	1,2,3,4	PPT, Discussion	Class Test Debate
6	Organization Systems – Stress Management ; Meaning of Work-force Diversity; Concept of Organizational Culture; Concept of Change	3	1,2,3,4	PPT, Discussion	Class Test

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	Kavita Singh	Organizational Behaviour	2015, 3rd edition	Pearson Publication
2 International	Robbins, Timothy Judge, SeemaSanghi	Organizational Behaviour	12th edition	Stephen Pearson Prentice Hall
3 National	M N Mishra	Organizational Behaviour	2010	Vikas Publishing House Pvt. Limited
4 International	Fred Luthans	Organizational Behaviour	13th edition	Mc Grow Hill Inc
5 International	John Newstrom and Keith Davis	Organizational Behaviour	11th edition	Tata McGrow Hill

Online Resources

Online Resources No.	Web site address
1	www.bretlsimmons.com
2	https://www.youtube.com/watch?v=JIa7vP3gyL4
3	www.positivesharing.com
4	https://www.youtube.com/watch?v=r2Xv9Am7PWQ

MOOCs:

Resources No.	Web site address
1	Alisons
2	Swayam

1	**What Is Technical Communication?** Problem-Solving Approach to Communications Tasks, Communication as Solution, Conventions and Characteristics, Understanding the Rhetorical Situation, Case Study: The Cost of Poor Communication, Writing Processes.	8	CO 1, CO2	Lecture with Ppts Quiz	Understand, Create	Quiz, case study
2	**Professional Style -** Reader-Centred Writing. Professional Tone, Writing Constructively, Communicating with Precision, The 7 Cs of Professional Writing, Sentence Variety and	6	CO 1, CO2, CO4	Lecture with Ppts	Understand, Apply,	Quiz, c Study

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VII	707	**Technical Writing**	
Type	**Credits**	**Evaluation**	**Marks**
Ability Enhancement Course	2	IA	50

Course Objectives:

- To introduce the basic concepts of Technical Writing.
- Examine the types of user manual, release notes, Application Programming interface for Technical Writing.
- Discover task analysis, and content development effectively.

Course Outcomes :

CO1 : Understand meaning, goals and significance of Technical writing in IT Profession.

CO2 : Develop and plan a document, estimating the Technical Documentations.

CO3 : Apply the techniques for profiling, task analysis, and content development.

CO4 : Understand strategies for the teamwork.

Unit		**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**What Is Technical Communication?** Problem-Solving Approach to Communications Tasks, Communication as Solution, Conventions and Characteristics, Understanding the Rhetorical Situation, Case Study: The Cost of Poor Communication, Writing Processes.	8	CO 1, CO2	Lecture with Ppts Quiz	Understand, Create	Quiz, case study
2	**Professional Style -** Reader-Centred Writing. Professional Tone, Writing Constructively, Communicating with Precision, The 7 Cs of Professional Writing, Sentence Variety and	6	CO 1, CO2, CO4	Lecture with Ppts Quiz	Understand, Apply, Evaluate, Create	Quiz, case Study

	Length, Precise Wording, Image description, Writing To Persuade, Avoiding Ad-Speak, communicating Ethically, The Importance of Verbs					
3	**Document Design And Teamwork -** Readability, Genres and Conventions, Style Guides and Templates, Headings-General Principles for Designing Headings, Different levels of Heading, Lists - Types of Lists Figures and Tables, Conventions for Integrating Visuals in your Document, Style Tips Team Project Management Tools and Strategies, Team Charters Meeting Documents: Agendas and Minutes, Gantt Charts, Work Logs, Introduction to Five Models for Understanding Team Dynamics, collaborative Writing, Managing Team Conflict.	10	CO 1, CO2, CO3,CO4	Lecture with Ppts Quiz	Understand, Apply, Evaluate, Create	Quiz, case study

Reference Books :

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Michelle Carey, Moira McFadden Lanyi Source : https://pressbooks.bccampus.ca/technicalwriting	Technical Writing Essentials	-	BCCampus

Web Resources:

Resources No.	Web site address
1	https://technicalwriterhq.com/writing/technical-writing

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VIII	**801**	**Cloud Computing**	
	Prepared by	**Dr. Mukund Kulkarni**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

- Students will learn an overview of the field of Cloud Computing.
- Students will understand virtualization and its role in cloud computing.
- Students will gain hands-on experience solving relevant problems through projects that will utilize existing public cloud tools.
- Students will develop the skills needed to use cloud computing technique and will be able to create strategies for flexible and scalable cloud infrastructure.

Course Outcomes :

CO1: Define the key characteristics of cloud computing and recall different cloud service models (IaaS, PaaS, SaaS) and deployment models.
CO2: Explain the concept of virtualization and its role in cloud computing.
CO3: Apply security measures to address challenges in a cloud environment.
CO4: Analyze components of Infrastructure as a Service (IaaS) such as computing, storage, and networking.
CO5: Critically assess compliance and legal issues related to cloud security.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Cloud Computing Fundamentals** Definition of Cloud Computing, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds	6	CO 1	Lecture with Ppts Quiz	Remembering	Quiz End Term Internals:Short Answers
2	**Virtualization And Cloud Computing** Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery;	8	CO 1, CO 2	Lecture with Ppts Psychometric Tools	Understanding Applying	Quiz End Term: Applied Questions

	next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud					
3	**Service Oriented Architecture And The Cloud** Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing.	8	CO 3	Lecture with PPTs Case Study	Applying	Presentations End Term Exams: Case based Questions/ Applied Questions
4	**Deploying Web Services in the Cloud** Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.	5	CO3 CO4	Lectures with PPT, Tutorial and practical demonstration	Analyze	Group Activity End Term Exam: Short case and situation based questions
5	**Management of Cloud Services** Reliability, availability, and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud-based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints, and	8	CO3, CO 4	Lecture Case Activity	Analyze Evaluate	Case Presentation Activity End Term: Theory Applied

	business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)					
6	**Application Development & Case Studies** Application Development Service creation environments to develop cloud-based applications. Development environments for service development; Amazon, Azure, Google App. Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)	10	CO 4 CO 5	Lectures with PPTs Flip Classroom	Evaluate Create	Activity End Term: Theory Applied

Reference Book:

Sr. No.	Name of the Author	Title of the Book	Publisher Company
1	Rajkumar Buyya, James Broberg and Andrzej M. Goscinski	Cloud Computing: Principles and Paradigms	Wiley, 2011.
2	Kai Hwang, Geoffery C. Fox, jack Elsevierm	Distributed & Cloud computing	2012
3	John W. Rittinghouse, James E Ransome	Cloud Computing implementation management, and security	CRC Press, Taylor& Francis group,2010

4	Anthony T. Velte, Toby J. Velte Robert Elsenpeter	Cloud Computing a practical approach	Tata Mc Graw Hill edition,2010
5	George Reese,	Cloud Application Architecture	Oreilly publishers
6	David S. Linthicum,	Cloud computing and SOA convergence in your enterprise	Addison-Wesley

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**CourseTitle**	
VIII	**802**	**Enterprise Resource Planning**	
	Prepared by	**Prof. Deelip Patil**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSC	**3**	UE(60)+IE(40)	100

Course Objectives:

Objectives:

- To provide students with a thorough understanding of the fundamental concepts, principles, and frameworks of Enterprise Resource Planning.
- To equip students with the skills necessary for successful ERP implementation in real-world organizational settings.
- To provide students with a detailed understanding of core ERP modules and related technologies that enhance organizational efficiency.

Course Outcomes:

After completing the course, the students shall be able to

CO1: Understand concept, need and significance of ERP.
CO2: Apply different concept regarding ERP implementation.
CO3: Analyze ERP models and related technologies.
CO4: Describe popular products and future trends in ERP.

Unit	Content	Sessions	COs Number	Teaching Methodology	CognitionLevel	EvaluationTools
Foundations of Enterprise Resource Planning (ERP)	Introduction to ERP, Definition and significance of ERP, Historical evolution of ERP systems, Core principles and concepts of ERP, Organizational Structure and Processes, ERP Components and Architecture, Benefits and Risks of ERP, Business Process Reengineering (BPR)	9	CO1	Lecture	Understand	Quiz Short Answers

ERP Implementation Strategies and Life Cycle	ERP Implementation challenges, ERP Implementation Strategies, Selection of ERP Subsystems, ERP Implementation Life Cycle, Vendor Selection and Role of Consultants	12	CO2	Lectures with PPTs	Apply	Quiz Short Answers
Core ERP Modules	Financial and Accounting Module, Inventory and Supply Chain Module, Sales and Distribution Module, Production and Human Resource Module, Customer Relationship Module	12	CO3	Lectures with PPTs	Analyze	Quiz Short Answers
ERP Related Technologies	Business Process Reengineering (BPR), Supply Chain Management (SCM), Customer Relationship Management (CRM), Management Information System (MIS), Role of MIS in ERP systems	6	CO3	Lectures with PPTs	Remember	Quiz Short Answers
Marketplace and Future Trends in ERP	ERP Market Dynamics, Overview of key ERP vendors: SAP AG, Oracle, JD Edwards, Emerging Trends in ERP, Critical Evaluation and Case Studies	6	CO4	Lectures with PPTs	Remember	Quiz Short Answers

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Alexis Leon	ERP Demystified	2008	Tata McGraw Hill
2	Vinod Kumar Grag and N.K. Venkitakrishnan	ERP- Concepts and Practice	2006	PHI
3	Sumner, M.	Enterprise Resource Planning	2005	Prentice Hall

Online Resources:

Online Resources No.	Website address
1	https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
VIII	**803**	**Blockchain Technology**	
	Prepared by	**Dr.Pratibha Jadhav**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UA(60)+IE(40)	100

Pre-requisite:
Basic knowledge of cryptography, networking, distributed systems and expertise in object-oriented programming.

Course Objectives:

To make students to:

- Provide the overview of the structure and mechanisms of Blockchain.
- Explain permissioned and decentralized Blockchain concepts.
- Understand cryptocurrency transactions and mining Blockchain.
- Understand the applications of Blockchain technology.

Course Outcomes:

After completing the course, the students shall be able to

CO1: Understand Blockchain technologies and their components.
CO2: Interpret the uses of cryptographic techniques in Blockchain.
CO3: Understand and analyze the consensus mechanisms in Bitcoin.
CO4: Understand and handles the smart contracts.
CO5: Demonstrate the use of hyperledger fabric and its components.

Unit	Content	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Introduction to Blockchain	Basics of blockchain, History, Uses of Blockchain, Structure of a block, Transactions, Public Ledger, Distributed Consensus. Peer to peer systems, centralized and decentralized systems, Types of blockchain.	9	CO1	Lecture with Ppt	Understand	Quiz Short Answers

Cryptographic Primitives	Basics of cryptography (Symmetric and Asymmetric) RSA algorithm Cryptographic hash functions – collision free, hiding, puzzle friendly (properties), Hash Chain, Hash tree- Merkle Tree, Public Key cryptography, Digital signatures.	9	CO2	Lecture with Ppt	Apply	Quiz Short Answers
Bitcoin	Basics (Structure of block, creation of coins), Double Spending, Script (FORTH), Mining Process, Objectives of consensus mechanisms, Consensus in Bitcoin – Proof of Work, Proof of Stake, Proof of Burn	9	CO3	Lecture with Ppt	Apply	Quiz Short answers
Permissioned Blockchain	Smart Contracts, Distributed Consensus, Faults in DC, Algorithms – Paxos, RAFT, Byzantine Fault Tolerance	8	CO4	Lecture with ppt	Apply	Quiz Short answers
Ethereum	History, Architecture, Account Types, Gas, Transactions, Structure (Blocks, Transactions), Accounts, Ether, Gas, Ethereum Virtual Machine, Solidity. Hyperledger Fabric: Features of hyperledger, Architecture, ordering service, Transaction Flow, Membership and Identity Management.	10	CO5	Lectures with PPTs	Demonstrate	Quiz Short Answer, Case study

Reference Books:

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder	Bitcoin and Cryptocurrency Technologies	2008	Princeton University Press
2	Don Tapscott,AlexTapscott	Blockchain Revolution		
3	Mark Gates,	Blockchain ultimate Guide to understanding Blockchain, Bitcoin,Cryptocurrencies, Smart Contracts and Future of money		Wise Fox Publishing
4	VikramDhillon, David Metcalf, Max Hooper, , Apress	Blockchain Enabled Applications		
5	Melanie Swan,	Blockchain Blueprint for a new economy,	First Edition,	O'Reilly,
6	MayukhMukhopadhyay, ,	Ethereum Smart Contract Development		Packt publishing, FirstEdition
7	Chris Dannen, ,	Introducing Ethereum and Solidity,		Apress
8	Nitin Gaur, Luc Desrosiers, Petr Novotny, Venkatraman Ramakrishna, Anthony O'Dowd,Salman,	A. Baset, Hands-On Blockchain with Hyperledger		Packt

Online Resources:

Online ResourcesNo.	Website address
1	https://blockexplorer.com/
2	https://en.wikipedia.org/wiki/Digital_signature
3	Public Key Cryptography - GlobalSign
4	What is Asymmetric Cryptography? Definition from SearchSecurity (techtarget.com)
5	What is Blockchain Technology? A Step-by-Step Guide For Beginners (blockgeeks.com)
6	The Truth About Blockchain (hbr.org)
7	How Does Ethereum Work? Understanding the Ethereum Network (coindesk.com)
8	A (Short) Guide to Blockchain Consensus Protocols - CoinDesk
9	Hyperledger Fabric
10	Proof of Work vs Proof of Stake: Basic Mining Guide - Blockgeeks

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme:BCA –RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
VIII	**804**	**Professional Ethics**	
Type	**Credits**	**Evaluation**	**Marks**
MDC	3	UE:IE	60:40

CourseObjectives:

- CO 1 To introduce students to the fundamental principles of professional ethics and the importance of ethical behaviour in corporate world
- CO 2 To teach students the skills and knowledge needed to identify ethical issues in professional situations and critical ethical reasoning.
- CO 3 To explore the ethical codes and guidelines specific to their intended or chosen profession, and what is needed in maintaining professional integrity.
- CO 4 To foster an understanding of the consequences of unethical behaviour in professional settings, emphasizing personal and professional accountability.
- CO 5 To encourage students to consider the impact of cultural and global diversity on ethical decision-making
- CO 6 To provide students with practical tools and strategies for ethical decision-making

CourseOutcomes:

1. Develop a deep understanding of various ethical theories and frameworks and the ability to apply these theories to analyze ethical issues in professional contexts.
2. Acquire practical skills in ethical decision-making, including the ability to recognize and define ethical dilemmas,
3. Familiarize oneself with relevant professional codes of ethics and industry-specific standards.
4. Develop an awareness of how cultural diversity and global contexts influence ethical perceptions and behaviors,
5. Enhance leadership and communication skills, with a focus on promoting ethical behavior within .
6. Understand the ethical responsibilities of professionals to contribute to the betterment of society

Unit		**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools

1	**Unit No 1. Introduction to Professional** • Introduction to Professional Ethics • Basic Concepts • Governing Ethics • Personal & Professional Ethics	6	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers
2	**Unit No 2 Skills** • Life Skills • Emotional Intelligence • Value Education	6	CO 2	Lecture with Ppts Case Study	Apply (Analyse)	Case Study , Study Aquired Skill End Term: Applied Questions
3	**Unit No 3. Ethical Decision-Making** • The Ethical Decision-Making Process by Josephson Institute • The Four-Component Model by Rest and Colleagues • The Six Pillars of Character by the Character Counts! Program: • Trustworthiness • Respect • Responsibility • Fairness • Caring • Citizenship.	6	CO 1 and 3	Lecture with PPTs Case Study	Learn Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Unit No 4 Ethical Issues in Professional Relationships / Work Place** • Professional roles and responsibilities • Conflicts of interest and loyalty	6	CO6 and 4	Lectures with PPTs	Evaluate Create	Case Study End Term Exam: Short case and situation based questions

	• Privacy and confidentiality • Communication and honesty • Workplace ethics and culture • Whistleblowing and reporting unethical behavior • Workplace discrimination and harassment					
5	• **Unit No 5 Ethics in the Digital Era** • Ethical considerations in the use of technology • Cybersecurity and privacy • Social media and online behaviour	6	CO5 and 6	Lecture Case Activity	Create	Case Activity Cyber Security End Term: Theory Applied

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1National	R. Subramanian,	Professional Ethics	2015	Oxford University Press
2National	Manuel G Velasquez,	Business Ethics concepts & Cases:	6e, PHI, 2008.	PrenticeHall
3.International	Michael J. Quinn,	Ethics for Information Age,	Eighth Edition,	Pearson

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.ala.org/tools/ethics
2	https://www.udemy.com/course/professional-ethics
3	https://www.youtube.com/@LearningwithDrAnandVyas
4	https://www.youtube.com/watch?v=po2CYVTmvwA
5	https://www.ted.com/talks/michael_schur_how_ethics_can_help_you_make_better_decisions?language=en
6	https://www.ted.com/talks/dawne_ware_ethics_yes_even_when_n

	obody_is_watching

MOOCs:

Resources No.	Website address
1	Alisons

Programme:BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VIII	**805**	**IPR**	
Type	**Credits**	**Evaluation**	**Marks**
AEC	1	IE	50

Course Objectives:

- Understanding, defining and differentiating different types of intellectual properties (IPs) and their roles in contributing to organizational competitiveness.

Course Outcomes :

CO 1: Understand different types of Intellectual Properties (IPs), Trade Mark, Copy Right, Patent.
CO 2: Understand the process of Registration
CO 3: Study the Legal issues associated with IPR

Unit		Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction To Intellectual Property**: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.	4	CO 1	Lecture with Ppts	Understand	Quiz Short Answers
2	**Copyright** Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right	5	CO2,CO3	Lecture with PPTs	Understand	Quiz Short Answers

	Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.					
3	**Trade Marks** : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes. **Law Of Patents** : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer	6	CO2, CO3	Lectures with PPTs	Understand	Quiz Short Answers

Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Deborah. E. Bouchoux, Cengage Learning.	Intellectual Property Rights		
2	Prabuddha Ganguli	Intellectual Property Rights– Unleashmy The Knowledge Economy		Tate Mc Graw Hill Publishing Company Ltd

MOOCs:

Resources No.	Web site address
1	NPTEL
2	Swayam
3	edx.com
4	coursera.com

Elective Group I – Data Analysis

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**CourseTitle**	
V	**Data Analysis 504-1-A**	**Data Analysis Using Excel**	
	Prepared by	**Dr.Kirti Mahajan**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSE	**3**	60(UE)+40(IA)	100

Course Objective:

To train the studentforusingthespreadsheetpackageMS-Excelforbusinessapplications.
To impart skill so finalizing data and presenting it using MS-Excel.

Course Outcomes:

After completing the course the students shall be able to

- **CO1**: **Visualization:** Students will be able to create and manage a variety of charts and graphs in Excel, such as column, line, pie, and scatter plots, as well as work with multiple sheets and hyperlinks.
- **CO2: Decision Making:** Students will develop the ability to analyze data to make informed decisions including using functions like IF and SUMIF, and evaluating results to ensure accuracy and reliability

Unit	Content	Sessios (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Excel** MS excel screen elements – Tool bar, title bar, ribbon, formulabar,statusbar.MovingaroundaWorksheet,enteringandformatting(e.g.Number,Text,DateandCurrency)data.Cellreferencing(relative,absolute,mixed), using formulae, Use of Find, Replace, Goto.	6	CO 1	Lecture with Ppts Quiz Excel assignment	Understand	Quiz End Term Internals: Short Answers
2	**Working with Excel** Insert,delete-cells,rows,columns.Sorting(basic, custom),filtering, grouping, ungrouping data, dealing with subtotals and grand totals. Validating data, protecting cells. Create, manage, and format pivot	6	CO 1	Lecture with Ppts Excel assignment	Apply	End Term: Applied Questions

	tables and pivot charts. What if Analysis					
3	**Conditional Formatting** Once defined, it will automatically change the formats as per conditions user inputs. Work with functions to manipulate strings of text and data	6	CO 1	Lecture with PPTs Excel assignment	Understand	End Term Exams: Applied Questions
4	**Commonly used functions** Sum, Max,Min,Average,Count,Today, Now,Datedif,Countif,CountA,CountBlank,Round,Roundup,RoundDown,ABS,Sign,Ceiling,Floor, Trim, Value, Clean, sqrt ,if ,sumif	8	CO2	Lectures with PPTs Excel assignment	Understand	End Term Exam: Applied Questions
5	**Data Viewing and Reviewing** Inserting comments, spell checks and changes to the worksheet data etc, Viewing data in different ways eg. Page break, normal etc	10	CO2	Lecture Excel assignment	Create	Activity End Term: Theory Applied
6	**Creating and managing charts** Create and modify graphs/charts like Column,Line,Pie,Bar,Area,Scatter,3Detc. Working with multiple sheets, hyper linking Work with sparklines. Perform Look UP tables.	9	CO2	Lectures with PPTs Flip Classroom Excel assignment	Create	Activity End Term: Theory Applied

References Books,

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	Albright	DataAnalysisandDecision MakingUsingMSExcel		
2	StwphenNelson	DataAnalysisForDuMmIES		
3	NarayanAshSah	Data Analysis Using Microsoft Excel		

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**CourseTitle**	
VI	**Data Analysis 604-1-B**	**Data Analysis Using R Programming**	
	Prepared by	**Dr.Kirti Mahajan**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSE	**3**	60(UE)+40(IA)	100

Course Objectives:

Course Objective:

To teach the Beginners of R Programming of the master level. A variety of topics will be covered that are important for Data Analysis in order to prepare the students for real life prediction of data engineering.

To impart knowledge of the concepts related to Probability and Application on data sets. It also gives the idea how data is managed in various environments with emphasis on Predictions measures as implemented in data sets.

Course Outcomes:

After completing the course the students shall be able to

CO1 : Apply Data Distribution Techniques: Students will gain knowledge about different types of data distributions including exponential, binomial, normal, and Poisson distributions. They will learn to generate random numbers and conduct Monte Carlo simulations.

CO2: Apply Statistical Models: Students will learn to implement correlation and regression analysis, analysis of variance (ANOVA), and create complex data structures for statistical analysis. They will be able to summarize data and analyze case studies using R programming

Unit	Content	Sessios (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction of Probability** Concept, Types of Probability, Permutation and Combination concept ,Addition and Multiplication Theorem, Condition Probability, Bayes's Theorem	8	CO 1	Lecture with Ppts Quiz Statistics assignment	Understand	Quiz End Term Internals: Short Answers
2	**Random Variable** Concept, Discrete and Continuous Random Variable, Probability density function, Mathematical Expectation and their Theorem	8	CO 1	Lecture with Ppts Statistics assignment	Apply	End Term: Applied Questions

3	**Data Distribution** Distribution, Types of Data distribution, Exponential distribution, Binomial distribution, Normal distribution, Poisson distribution, Random number generation, Monte Carlo Simulation.	8	CO 1	Lecture with PPTs Statistics assignment	Understand	End Term Exams: Applied Questions
4	**Testing of Hypothesis** Procedure of Testing Hypothesis, Standard Error and Sampling distribution, Estimation, Student's t-distribution, Chi-Square test and goodness of fit, F-test and analysis of variance. Factor analysis.	10	CO2	Lectures with PPTs Statistics assignment	Understand	End Term Exam: Applied Questions
5	**Introduction to R programming language** Getting R, Managing R, Arithmetic and Matrix Operations, Introduction to Functions, Control Structures. Working with Objects and Data: Introduction to Objects, Manipulating Objects, Constructing Data Objects, types of Data items, Structure of Data items, Reading and Getting Data, Manipulating Data, Storing Data.	6	CO2	Lecture R programming assignment	Create	Activity End Term: Theory Applied
6	**Graphical Analysis using R** Basic Plotting, Manipulating the plotting window, Box Whisker Plots, Scatter Plots, Pair Plots, Pie Charts, Bar Charts. **Advanced R** Statistical models in R, Correlation and regression analysis, Analysis of Variance (ANOVA), creating data for complex analysis, Summarizing data, and case studies	5	CO2	Lectures with PPTs Flip Classroom R programming assignment	Create	Activity End Term: Theory Applied

References Books:

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	S.C.Gupta	Fundamentals of Statistics	Seven Edition	
2	KaelenMedeiras	"R Programming Fundamentals		

3		Reinforcement Learning e-book		
4		Learning R Programming Guide on line		

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Elective Group II – Information Security

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
V	**Information Security 504-2-A**	**Information Security Concepts**	
	Prepared by	**Mr. Dhankumar Wadar**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	60(UE)+40(IA)	100

Course Objectives:

To make students to:

- Introduce the learner to concepts involved in Information Security domain
- Theoretical understanding of Information Security Concepts

Course Outcomes:

After completing the course the students shall be able to

CO1: To understand the basic concepts of information security.
CO2: To understand the application of Physical Security.
CO3: To understand the basic concepts of network security.
CO4: To understand the application of operating system security and database security.
CO5: To understand the concept of web application, standards and cyber space.

Unit	Content	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Information Security Concepts	Information Security, Need for Information Security Cyber Security and Information Security **CIA-**Confidentiality, Integrity and Availability of Information, Information classification Risk, Threats, Vulnerabilities Cyber Crimes Data Security Identification, Authentication and Authorization, Digital Signature, Cryptography, substitution and transposition ciphers, block cipher, stream cipher, Security Principles and Models	9	CO1	Lecture with Ppt	Understand	Short Answers

Physical Security	Physical Security and Facility Requirement, Perimeter Security, Fire Protection, Fire Suppression, Power Protection, General Environmental Protection, Equipment Failure Protection Environmental Security(Critical Infrastructure Security) Data Backup, Business Continuity and Disaster Recovery	8	CO2	Lecture with Ppt	Apply	Case Study
Network Security	**Network Security:** Secure Network design, Firewalls-Design and Types of Firewalls, Personal Firewalls,, IDS, email security, WLAN Security, VPNs, Types and Sources of Network Threats	8	CO3	Lecture with Ppt	Understand	Short answers
Operating System Security	Operating System Security and Application Security Windows, Linux/UNIX, file permissions in UNIX **Database Security:** MS SQL	8	CO4	Lecture with ppt	Understand	Short answers
Web Application Security & Compliance Standards	**Web Application Security, Cloud Security** Web Application Vulnerabilities, Secure Coding Techniques, Continuous Security Testing and Assessments Cloud Computing, Benefits, Security challenges **Compliance Standards :** IT Act, ISO 27001, ITIL Framework **Other Standards/Best practices – NIST CSF, SOC 2,** What's new in the Cyber World Cyber Threats, Types Security Operations Center Cyber Forensics AI and Cyber Security	12	CO5	Lectures with PPTs	Understand	Short Answer

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Linda Volonino & Reynaldo Anzaldua	Computer Forensics: Principles and Practices	2006	Pearson
2	Jason Andress	The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice 1st Edition Kindle Edition	2011	Syngress

Online Resources:

Online Resources No.	Website address
1	https://www.javatpoint.com/principle-of-information-system-security
2	https://www.javatpoint.com/cyber-security-and-information-security
3	https://www.geeksforgeeks.org/what-is-information-security/

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.coursera.com

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
VI	**Information Security 604-2-B**	**Information Security Administration**	
	Prepared by	**Mr. Dhankumar Wadar**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	60(UE)+40(IA)	100

Course Objectives:

- Introduce the learner to concepts involving security administration
- Introduce the learner about setup of LAN, connection and its setup.

Course Outcomes:

After completing the course the students shall be able to

CO1: To understand the setup, manage and security of a client.
CO2: To understand the setup, manage and security of LAN.
CO3: To understand the connection of a LAN to the Internet.
CO4: To understand sharing an Internet connection and resources over a LAN.
CO5: To understand Setup support servers and Hosting a Website.

Unit	Content	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
Setup a Client	Introduction to client-side devices, Setup, Manage and Secure a Desktop PC Setup, Manage and Secure a Mobile Device Monitoring and managing the Client OS and Applications	9	CO1	Lecture with Ppt	Understand	Quiz Short Answers
Setup a LAN	Introduction to LAN devices, Simulate a LAN, Setup, Manage and Secure a Local Area Network Firewalls, Zero Trust, Segmentation	9	CO2	Lecture with Ppt	Understand	Case Study
Connect a LAN to the Internet	Introduction to WAN devices, Setup, Manage and Secure a Connection to the Internet	6	CO3	Lecture with Ppt	Understand	Quiz Short answers

Share an Internet Connection & resources over a LAN	Introduction to Internet Connection sharing, Introduction to NAT and PAT Setup, Manage and Secure a Proxy Server, Implementing Security policies, Login Security **Share resources over a LAN:** Setup, Manage and Secure a Print Server, Setup, Manage and Secure a File server	10	CO4	Lecture with ppt	Understand	Quiz
Setup support servers & Hosting a Website	**Setup support servers:** Setup, Manage and Secure a Mail Server, Setup, Manage and Secure a FTP Server, Setup, Manage and Secure a Boot Server, Setup, Manage and Secure a DNS Server **Host a Website:** Introduction to website hosting, Setup, Manage and Secure a Web Server	11	CO5	Lectures with PPTs	Understand	Quiz Short Answer

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Christopher Negus	Red Hat Linux Bible: Fedora and Enterprise Edition	2003	
2	Mark Stamp	Information Security, Principles and Practice	2011	Wiley India

Online Resources:

Online Resources No.	Website address
1	https://www.tutorialspoint.com/communication_technologies
2	https://www.pcweenie.com/book/export/html/23

MOOCs:

Resources No.	Website address
1	https://www.mooc-list.com/tags/security-management
2	https://www.futurelearn.com/courses/digital-security-policy-and-management-sc
3	www.coursera.com

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
V	**Data Science 504-3-A**	**Statistical Programming using R**	
	Prepared by	**Dr.M.K.Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	60(UE)+40(IA)	100

Elective Group III – Data Science

Course Objectives:

- To teach the Beginners of R Programming of the a master level.
- A variety of topics will be covered that are important for Data science to prepare the students for real life prediction of data engineering.
- To impart knowledge of the concepts related to Probability and Application on data sets.
- It also gives the idea how data is managed in various environments with emphasis on Predictions measures as implemented in data sets.

Course Outcomes:

CO1: Remember the definitions of concepts and their Implementation in R.
CO2: Understand the concept of data and statistical techniques for its Implementation.
CO3: Design different data behaviors and their Predictions.
CO4: Analyzing Data set & Studying Historical Data.
CO5: Convert the historical Data into Prediction Model using R

No.	Content	Session (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction of Probability** Concept, Types of Probability, Permutation and Combination concept, Addition and Multiplication Theorem, Condition Probability, Bayes's Theorem	8	CO 1 CO 2	Lecture with PPTs	Understand	Problems and its Solution
2	**Random Variable** Concept, Discrete and Continuous Random Variable, Probability density function, Mathematical Expectation and their Theorem	5	CO 1 CO 2	Problem Illustration	Apply (Analyze)	Problems and its Solution
3	**Data Distribution** Distribution, Types of Data distribution, Exponential distribution, Binomial distribution, Normal distribution, Poisson	7	CO 3	Concept Explanation, Mathematical Problems, and its Solution	Analyze	Problems and its Solution

	distribution, Random number generation, Monte Carlo Simulation.					
4	**Testing of Hypothesis** Procedure of Testing Hypothesis, Standard Error and Sampling distribution, Estimation, Student's t-distribution, Chi-Square test and goodness of fit, F-test and analysis of variance. Factor analysis.	5	CO4	Concept Explanation, Mathematical Problems, and its Solution	Evaluate	Problems and its Solution
5	**Introduction to R programming language** Getting R, Managing R, Arithmetic and Matrix Operations, Introduction to Functions, Control Structures. Working with Objects and Data: Introduction to Objects, Manipulating Objects, Constructing Data Objects, types of Data items, Structure of Data items, Reading and Getting Data, Manipulating Data, Storing Data.	5	CO 5	Concept Explanation, Mathematical Problems, and its Solution	Create	Problems and its Solution
6	**Graphical Analysis using R** Basic Plotting, Manipulating the plotting window, Box Whisker Plots, Scatter Plots, Pair Plots, Pie Charts, Bar Charts.	5	CO 5	Software Demonstration and use of R Language	Evaluate	Problems and its Solution
7	**Advanced R** Statistical models in R, Correlation and regression analysis, Analysis of Variance (ANOVA), creating data for complex analysis, Summarizing data, and case studies.	10	CO 5	Software Demonstration and use of R Language	Evaluate	Problems and its Solution

References Books:

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	S.C.Gupta	Fundamentals of Statistics	Seven Edition	
2	KaelenMedeiras	"R Programming Fundamentals		
3		Reinforcement Learning e-book		

4		Learning R Programming Guide on line		

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VI	**Data Science 604-3-B**	**Introduction to Data Science**	
	Prepared by	**Dr.M.K.Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	60(UE)+40(IA)	100

Course Objectives:

- To teach the Beginners of Data analysis through R /Python Programming of the a master level.
- A variety of topics will be covered that are important for Data science in order to prepare the students for real live Project Analysis
- To impart knowledge of the concepts related to Machine Learning and implement and variety Application on data sets.
- It also gives the idea how data is managed in various environments with emphasis on Analysis measures as implemented.

Course Outcomes:

CO1: Remember the definitions of concepts and their Programming skills.
CO2: Understand the fundamentals of Data Science, methods, techniques, and its implementation
CO3: Design different Model, test for its validity, and apply to different domain area.
CO4: Design different Model, test for its validity, and apply to different domain area.
CO5 Analysing Data set and Comparing different Model.Convert the analysis in Modern approaches.
CO6: Write R/Python coding for Analysis

Unit No.	Content	Session (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to data science:** definition, benefits, applications; data science process: overview, defining the goal, retrieving data, data preparation, EDA, model building, model evaluation, data presentation; machine learning: definition, types of machine learning: supervised learning, unsupervised learning, semi-supervised learning, Reinforced learning; **Association Rule** Mining Frequent Patterns, Associations, and Correlations: Basic	5	CO 1 CO 2	Lecture with PPTs	Understand	Problems and its Solution

	Concepts and a Road Map, Association Rules, the Apriori Algorithm Classification and Prediction					
2	**Classification** Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling	5	CO 2 CO 3	Problem Illustration	Apply (Analyze)	Problems and its Solution
3	**Prediction** Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor. Clustering : Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering	5	CO 3 CO4	Concept Explanation, Mathematical Problems, and its Solution	Analyze	Problems and its Solution
4	**Linear Regression** Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection	5	CO 3 CO 4	Concept Explanation, Mathematical Problems, and its Solution	Evaluate	Problems and its Solution
5	**Logistic Regression** Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables	5	CO 3 CO 4	Concept Explanation, Mathematical Problems, and its Solution	Create	Problems and its Solution
6	**Deep Learning** History, Scope and specification, why deep learning now, building	10	CO 5 CO 6	Software Demonstration and use of R Language	Evaluate	Problems and its Solution

	block of neural network, neural networks, Deep learning hardware. Backward and forward neural networks, XOR model, cost function estimation (maximum likelihood), units, activation functions, layers, , normalization, hyper-parameter tuning, Convolution neural networks, architecture					
7	**Case study** Iris Data set ,Loan Data set, Titanic survival Data set ,Share Market Data set, Covide -19 Data set etc	10	CO 5 CO 6	Software Demonstration and use of R Language	Evaluate	Problems and its Solution

References Books:

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	GopinathRebala	An Introduction to Machine Learning		Springer
2	S.C.Gupta	Fundamentals of Statistics		
3	John D.Kelleher	Deep Learning		MIT Press

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
V	**Information System 504-4-A**	**E-Commerce**	
	Prepared by	**Dr.Devendra Puntambekar**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	60(UE)+40(IA)	100

Course Objectives:

- To thoroughly understand the information technology for supporting E-commerce;
- To understand the necessary infrastructure and functional components to develop Ecommerce systems;
- To understand the design and application of E-commerce systems.

Course Outcomes:

CO1: Recognize the impact of Information and Communication technologies, especially of the Internet in business operations

CO2: Recognize the fundamental principles of e-Business and e-Commerce

CO3: Use tools and services of the internet in the development of a virtual e-commerce site

Elective Group III – Information System

Unit	Content	Sessions(Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to E-Commerce:** Definition, E-commerce fundamentals, different types of E-commerce E-Commerce Infrastructure - The Internet and World Wide Web, Web system, Internet basics, Characteristics of Internet, Components of Internet – Uniform Resource Locators, Internet Protocol, Hypertext Transfer Protocol (HTTP), Internet Service Provider (ISP), Types of ISP, domain name, domain name types E-commerce vs Traditional Commerce, Networking Categories, Mobile Commerce	8	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers
2	**Business Models for e-commerce:**	8	CO 2	Lecture with Ppts Case Study		Case Study , Newspaper Article

	Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business(B2B) **Electronic Data Interchange** Requirement of EDI, types of EDI, Advantages and Disadvantages of EDI			Psychometric Tools	Apply (Analyse)	End Term: Applied Questions
3	**E-commerce Payment System:** Limitations of traditional payment system, requirement of e-payment system, Internet payment systems - Credit card payment (e.g., SET protocol), E-cash, E-check, smart card, Electronic Funds Transfer, Digital Token Based E-Payment Systems, Modern Payment Systems, Steps for Electronic Payment, Payment Security, Net Banking , Payment Security, concerns and measures	8	CO 2	Lecture with PPTs Case Study	Understand	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Applications of E-Commerce:** E-commerce in banking, retailing, online publishing, online marketing, e-advertising, e-branding.	6	CO2	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions
5	**E-commerce Security:** Security issues, Privacy issues, Computer Security, security threats, security tools, Denial-of-Service attacks, Viruses, Unauthorized access to a computer network, Vulnerability of Internet Sites requirements, malicious code, intruders, attacking methods, Cryptography- encryption and decryption, public key encryption, private key cryptography, message digest, digital signature, digital certificate, firewalls, SSL. Firewall – Packet filtering, Application gateways.	9	CO2	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	**Implementation of E-Commerce:** WWW.EBAY.COM - B2C Website – Registration, Growth of eBay, PayPal –	6	CO2, CO3	Lectures with PPTs Flip Classroom	Create	Activity End Term: Theory Applied

	New Trend in Making Payments Online, National Electronic Funds Transfer.					

References Books:

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	C.S.V. Murthy	E-commerce		Himalaya Publishing House
2	P.T. Joseph,	E-commerce A Managerial Perspective		Prentice Hall Of India
3	Kalakota and Whinston	Frontiers of Electronics Commerce		Pearson Education

Programme: BCA CBCS –Revised Syllabus w.e.f. - Year 2022 – 2023			
Semester	**Course Code**	**Course Title**	
VI	**Information System 604-4-B**	**Knowledge Management**	
	Prepared by	**Dr.Devendra Puntambekar**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	60(UE)+40(IA)	100

Course Objectives:

- The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.

Course Outcomes:

CO1: Will be able to understand the concepts of Knowledge and knowledge management .
CO2: Can be able to design and develop Knowledge management systems for Business applications .

Unit	Content	Sessons (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction:** Definition,Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge	9	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Drivers of knowledge Management:** Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KM strategy.	8	CO 2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied Questions
3	**Technology and KM:** Technology components of KM – IT & KM , Ecommerce and KM	7	CO 2	Lecture with PPTs Case Study	Understand	Case Study with Presentations End Term Exams: Case based Questions/A

						pplied Questions
4	**Total Quality Management and KM:** TQM and KM , Bench marking and KM. Approaches to TQM: PDCA Cycle (Plan-Do-Check-Act): A structured approach to problem-solving and continuous improvement. Six Sigma: A data-driven methodology for reducing defects and improving quality. Lean Manufacturing: A system for eliminating waste and maximizing efficiency. ISO 9000: A set of international standards for quality management systems	6	CO2	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions
5	**Implementation of KM:** Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM	7	CO2	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	**KM and Organizational Restructuring:** The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation. **Case studies in Knowledge Management :** Knowledge management in Health Care, Knowledge Management in Human Resource Management	8	CO2	Lectures with PPTs Flip Classroom	Create	Activity End Term: Theory Applied

References Books:

Sr. No.	Name of theAuthor	Title of the Book	Year Edition	Publisher Company
1	MadhukarShukla	Competing Through Knowledge-Building a learning Organisation		Himalaya Publishing House
2	Tiwana	The Knowledge Management Toolkit: Practical Techniques for building a Knowledge Management Systems		Pearson Edu
3	Honey Cutt	Knowledge Management Strategies		PHI, New Delhi.

4	Awad	KM		Pearson Edn, 2007
5	Barnes	Knowledge Management Systems		Thomson
6	IkudiroNonka&Hirotaka Takeuchi	The Knowledge – Creating Company		Oxford University Press,London.

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year			
Semester	**Course Code**	**Course Title**	
V	504-5-A	**Blockchain Technology and Platforms**	
	Prepared by	**Dr. Anjali Dadhich**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UA(60)+IE(40)	100

Pre-requisite:
Basic knowledge of cryptography, networking, distributed systems and expertise in object-oriented programming.

Course Objectives:

To make students to:

- Understand how blockchain systems (mainly Bitcoin and Ethereum) work.
- Understand Blockchain Platforms applications.
- Integrate ideas from working of Corda and R3 Platforms.

Course Outcomes:

After completing the course, the students shall be able to

1. Explain the basic concepts and technology used for blockchain
2. Describe the primitives of the Cryptocurrency and Bitcoin related to blockchain.
3. Illustrate the concepts of Blockchain Platforms
4. Analyze the working of Corda and R3 Platforms

Unit	Sub Unit	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools

1. Introduction to Block chain Technology and basic cryptograpy	Blockchain Introduction ,How does a Blockchain work,The origins of blockchain, Blockchain Applications. Blockchain came from Bitcoin, Why is Blockchain a Distributed, P2P Network?, Blockchain Vs Cryptocurrency, Types of Blockchain.	6	CO1	Lecture with Ppt	Understand	Quiz Short Answers

Cryptocurrency and Bitcoin:	What Are Different Blockchain Technologies?, Benefits of using Blockchain Technology, The Origin of block chain Completed,Blockchain came from Bitcoin.	8	CO2	Lecture with Ppt	Apply	Quiz Short Answers
Understanding Blockchain and Consensus Algorithms	Blockchain Technology, The Evolution of Blockchain Technology, Blockchain Technology – Basics, Introduction to the Decentralized Web Introduction to Distributed Ledgers, Merkle Tree and Hashing, Blocks, Wallets, and Addresses, Public and Private Key. Cryptography and Cryptographic Algorithms, Transaction Execution and Distribution, Components of Blockchain Ecosystem, Blockchain Architecture.	8	CO1,CO3	Lecture with Ppt	Apply	Quiz Short answers
Blockchain Platforms	What are Blockchain Platforms?, Types of Blockchain Platforms, Key Features and Characteristics, Blockchain as a Service (BaaS), Use Cases and Adoption Trends.	8	CO4	Lecture with ppt	Apply	Quiz Short answers
Corda and R3 Platforms	Introduction to Corda, Corda's Approach to Privacy, Smart Contracts in Corda, Corda Enterprise Solutions, Use Cases in Financial Services.	10	CO4	Lectures with PPTs	Demonstrate	Quiz Short Answer, Case study

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year			
Semester	**Course Code**	**Course Title**	
VI	604-5-B	**Blockchain Platforms and Ecosystems**	
	Prepared by	**Dr. Anjali Dadhich**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UA(60)+IE(40)	100

Pre-requisite:
Basic knowledge of cryptography, networking, distributed systems and expertise in object-oriented programming.

Course Objectives:

To make students to:

- To understand a broad overview of the essential concepts of blockchain technology.
- To Learn techniques and tools to tackle the security related issues of blockchain
- To understand the working and importance of smart contracts
- To understand different types of Decentralized applications developed using blockchain technology

Course Outcomes:

After completing the course, the students shall be able to
CO1: To illustrate the essential components of a blockchain platform
CO2: To learn and apply security analysis and performance-enhancing techniques related to blockchain.
CO3: To understand the working and importance of Solidity Programming.
CO4: To understand the concept of private and public blockchain technology.

Unit	Sub Unit	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1. Programming for Blockchain	Introduction to Smart Contracts, Types of Smart Contracts, Structure of a Smart Contract, Smart Contract Approaches, Limitations of Smart Contracts. Case Study on any of the Blockchain Platforms	6	CO1	Lecture with Ppt	Understand	Quiz Short Answers

2. **Solidity Programming**	Introduction to Programming: Solidity Programming – Basics, functions, Visibility and Activity Qualifiers, Address and Address Payable, Bytes and Enums, Arrays-Fixed and Dynamic Arrays, Special Arrays-Bytes and strings, Struct, Mapping, Inheritance, Error handling	8	CO2	Lecture with Ppt	Apply	Quiz Short Answers
3. Public Blockchain	Introduction to Public Blockchain, Ethereum and its Components, Mining in Ethereum, Ethereum Virtual Machine (EVM), Transaction, Accounts, Architecture and Workflow, Comparison between Bitcoin and Ethereum Types of test-networks used in Ethereum, Transferring Ethers using Metamask, Mist Wallet, Ethereum frameworks, Case study of Ganache for Ethereum blockchain. Exploring etherscan.io and ether block structure	8	CO3	Lecture with Ppt	Apply	Quiz Short answers
4. Private Blockchain	Introduction, Key characteristics, Need of Private Blockchain, Smart Contract in a Private Environment, State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS and RAFT, Byzantine Faults: Byzantine Fault Tolerant (BFT) and Practical BFT	8	CO1, CO4	Lecture with ppt	Apply	Quiz Short answers
5.Introduction to Hyperledger	Introduction to Hyperledger, Tools and Frameworks, Hyperledger Fabric, Comparison between Hyperledger Fabric & Other Technologies Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow, Working of Hyperledger Fabric, Creating Hyperledger Network, Case Study of Supply Chain Management using Hyperledger	10	CO3,CO4	Lectures with PPTs	Demonstrate	Quiz Short Answer, Case study

Reference Books Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1.	Imran Bashir,	Mastering Blockchain: Deeper insights into decentralization cryptography	Packt Publishing	2017
2.	Tiana Laurence,	Blockchain for Dummies, 2nd Edition	John Wiley & Sons.	2019
3.	Narayan Prusty	Building Blockchain Projects	Packt Publishing	2017

Online Resources No.	Website address
1	https://tech.seas.harvard.edu/free-blockchain
2	https://www.coursera.org/learn/blockchain-basics
3	https://skillsbuild.org/students/course-catalog/blockchain

MOOCs: Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com

Programme Name	Batchlor of Computer Application	**Semester**	V
Course Title	Theory of Artificial Intelligence 504-6-A		
Course Scheme	**(L-T-P: 3-0-0) (UE:60 , IE : 40)**		

Course Outcomes:

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

CO1. Understand artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.

CO2. To solve problems by applying a suitable search method, and AI applications in Natural Language Processing, Vision and Robotics.

CO3. Compare mini-max search and alpha-beta pruning in game playing.

CO4. Implement pushdown automata and establish the equivalence between finite automata and regular grammars, as well as between pushdown automata and context-free grammars.

CO5. Differentiate the key aspects of evolutionary computation, including genetic algorithms and genetic programming.

Course Contents		CO Mapped	Teaching Hours/Week
1	**Introduction:** Overview and historical perspective, Turing test, physical symbol systems and the scope of symbolic AI, Agents.	1	3
2	**Searching techniques:** State Space Search: Depth First Search, Breadth first Search, DFID. Heuristic Search Best First Search, Hill Climbing, Beam Search, Taboo Search. Randomized Search Simulated annealing, Genetic Algorithms, Ant colony optimization.	1,2	4
3	**Finding Optimal Paths:** Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search.	3	4
4	**Problem Decomposition:** Goal Trees, AO*, Rule Based Systems, Rete Net.	3,4	5
5	**Game Playing:** Minimax Algorithm, Alpha Beta Algorithm, SSS*.	4	5
6	**Planning and Constraint Satisfaction:** Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Constraint Propagation.	3	5
7	**Logic and Inferences:** Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining.	4	2
8	**AI Applications:** AI applications in Natural Language Processing, Vision and Robotics**.**	4	2
9	Advances in AI	4	2

Text Books	
1	Deepak Khemani,"A First Course in Artificial Intelligence", McGraw Hill Education (India), 2013.
2	Stuart Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", Prentice Hall, 3rd Edition, 2009.

Name	Batchlor of Computer Application	**Semester** – VII
Course Title	Theory of Machine Learning 604-6-B	
Course Scheme	(L-T-P: 3-0-0) (UE:60, IE:40)	

Course Outcome :

1. Demonstrate fundamentals of different Machine Learning Techniques.
2. Apply regression, classification, and clustering methods for problem solving.
3. Demonstrate the usages of supervised and unsupervised learning methods.
4. Apply advanced techniques of machine learning to solve complex problems.

Course Contents		CO Mapped	Teaching Hours/ Week
1	**Introduction:** Learning Problems , Perspectives and Issues , Concept Learning , Version Spaces and Candidate Eliminations , Inductive bias ,Decision Tree learning , Representation , Algorithm , Heuristic Space Search	1	6
2	**Instant Based Learning**: K- Nearest Neighbor Learning, Locally weighted Regression, Radial Bases Functions , Case Based Learning. Association Rule Learning: Apriori, FP Growth ,Clustering: Centroid based , K-means, Distribution based , EM, Density based ,DB Scan ,Regression: Linear Regression, Interpolation & Extrapolation, Nonlinear regression Artificial Neural Networks : Network Function, Cost, Learning Paradigms, Gradient Descent ,SVM : Classifier, Kernel, Parameter Selection	2	10
3	**Bayesian And Computational Learning**: Bayes Theorem , Concept Learning , Maximum Likelihood , Minimum Description Length Principle , Bayes Optimal Classifier , Gibbs Algorithm , Naïve Bayes Classifier , Bayesian Belief Network , EM Algorithm , Probability Learning , Sample Complexity , Finite and Infinite Hypothesis Spaces , Mistake Bound Model	2	8
4	**Neural Networks And Genetic Algorithms**: Neural Network Representation , Problems ,Perceptron, Multilayer Networks and Back Propagation Algorithms , Advanced Topics , Genetic Algorithms , Hypothesis Space Search , Genetic Programming , Models of Evaluation and Learning Softmax Function , One Hot Encoding , Cross Entropy , Stochastic Gradient Descent , Learning Rate Decay , Prameter Hyperspace, ReLU – Regularization, Deep NN, Architectures, Back , propagation, CNN, RNN, LSTM, Deep Boltzmann Machine	3	8

5	**Advanced Learning**: Learning Sets of Rules , Sequential Covering Algorithm ,Learning Rule Set , First Order Rules, Sets of First Order Rules , Induction on Inverted Deduction , Inverting Resolution , Analytical Learning , Perfect Domain Theories , Explanation Base Learning , FOCL Algorithm ,Reinforcement Learning , Task , Q- Learning , Temporal Difference Learning Advances In the domain	4	8

Text Books	
1	Tom M. Mitchell, Machine Learning, McGraw-Hill, 1st edition, 1997 Ethem Alpaydin
2	Introduction to Machine Learning (Adaptive Computation & Machine Learning), The MIT Press 2004

Programme: BCA CBCS– Revised Syllabus w.e.f.-Year			
Semester	**Course Code**	**Course Title**	
V	504-7-A	**Advanced Computer Network**	
	Prepared by	**Prof. Ujwala Kawade**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UA(60)+IE(40)	100
Pre-requisite: Basic Knowledge of Computer fundamentals and Computer Network.			
Course Objectives:			
To make students to: • This course focuses on advanced networking concepts for next generation network architecture and design • It covers SDN and virtualization for designing next generation networks			
Course Outcomes:			

After completing the course, the students shall be able to
CO1: Understand advanced concepts and next generation networks
CO2: Analyze TCP/IP variants, network Algorithm's, Protocols and their functionalities
CO3: Comprehend features of SDN and its application to next generation systems
CO4: Analyze the performance of various server implementations

Unit	Sub Unit	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1: Computer Networks and the Internet:	History of Computer Networking and the Internet, Networking Devices, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones. Networking Models: 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing, Equal- Sized Packets Model: ATM..	4	CO1	Lecture with Ppt	Understand	Quiz Short Answers

2: NETWORK ROUTING ROUTING AND ITS CONCEPTS	Network Routing Routing and its concepts: Structure of a Router, Basic Router Configuration, Building a Routing Table, Static Routing, Dynamic Routing Distance Vector Routing Protocol (RIPv1, RIPv2, EIGRP), Link State Routing Protocols (OSPF).	4	CO2	Lecture with Ppt	Apply	Quiz Short Answers
3 : LAN SWITCHING: SWITCHING AND ITS CONCEPTS	LAN Switching: Switching and its concepts: Structure of a Switch, Basic Switch Configuration, Virtual LANs (VLANs), VLAN Trunking Protocol (VTP), Spanning Tree Protocol (STP), Inter-VLAN Routing.	10	CO3	Lecture with Ppt	Apply	Quiz Short answers
4: WIDE AREA NETWORKS (WANS)	Introduction to WANs, Point-to-Point Protocol (PPP) concepts, Frame Relay concepts, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT), IPv6	7	CO4	Lecture with ppt	Apply	Quiz Short answers
5. NETWORK PROGRAMMING	Network Programming using Java: TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI) - Basic RMI Process, Implementation details Client Server Application	10	CO5	Lectures with PPTs	Demonstrate	Quiz Short Answer, Case study

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Computer Networks: A Systems approach, Larry L. Peterson & Bruce S. Davie, Fifth edition, Elsevier, rp2012.			
2	Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, Firoz Mosharaf, Tata McGraw Hill, 2012..			

Online Resources:

Online ResourcesNo.	Website address
1	https://nptel.ac.in/courses/106106107

2	https://nptel.ac.in/courses/106106168
3	http://csis.pace.edu/~marchese/CS865/Lectures/Chap7/Chapter7fin.htm
4	https://nptel.ac.in/courses/106104182

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
2	www.edx.com
3	www.coursera.com

Programme :BCA CBCS– Revised Syllabus w.e.f.-Year			
Semester	**Course Code**	**Course Title**	
VI	**604-7-B**	**Distributed Computing**	
	Prepared by	**Prof. Ujwala Kawade**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UA(60)+IE(40)	100

Pre-requisite:
Basic Knowlwedge of Computer Networks and Operating Systems.

Course Objectives:

To make students to:

- This course is an introduction to the design of distributed systems and algorithm that support distributed computing.
- To provide students with a comprehensive understanding of fundamental principles and techniques used to design and develop system.
- It aims to provide a practical exposure into the design and functioning of the existing distributed system.

Course Outcomes:

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

CO1: Understand the design principles in distributed systems and the architecture for distributed systems.
CO2:. Apply various distributed algorithms related to synchronization, buffering.
CO3: Analyze fault tolerance and recovery in distributed systems and algorithm.
CO4: Analyze the design and functioning of existing distributed system.
CO5: Implement techniques of resource and process management.

Unit	Sub Unit	Sessions (in Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1. Fundamentals	Evolution of Distributed Computing Systems, System models, issues in design of Distributed Systems, Distributed-computing environment, web based distributed model, computer networks related to distributed systems and web based protocols	6Hrs	CO1	Lecture with PPTs	Understand	As per individual faculty discretion
2. Message Passing:	Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of	10 Hrs	CO2	Lecture with PPTs	Apply(Analyse)	Group Discussion, case study

	Message Data, Process Addressing, Failure Handling, Group Communication.					
3. Remote Procedure Calls :	The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding ,Exception Handling, Security, Some Special Types of RPCs, Light weight RPC, Optimization for Better Performance	12Hrs	CO3	Lecture with PPTs	Apply(Analyse)	Case Study, test
4. Distributed Shared Memory :	Design and Implementation issues of DSM, Granularity,Structure of Shared memory Space, Consistency Models,replacement Strategy, Thrashing, Other Approaches to DSM,Advantages of DSM.	6Hrs	CO3, CO4	Lecture with PPTs	Evaluate	Case Study
5. Naming:	Desirable Features of a Good Naming System, FundamentalTerminologies and Concepts, Systems-Oriented Names, Namecaches, Naming & security, DCE directory services	6Hrs	CO4	Lecture with PPTs	Analyze	Case study

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year	Publisher Company
1	Distributed OS by Pradeep K. Sinha (PHI)			
2	Tanenbaum S.: Distributed Operating Systems, PearsonEducation			
3	Tanenbaum S. Maarten V.S.: Distributed Systems Principlesand Paradigms, (Pearson Education)			
4	George Coulouris, Jean Dollimore. Tim Kindberg: DistributedSystems concepts and design			

Online Resources:

Online ResourcesNo.	Website address
1	https://nptel.ac.in/courses/106106107
2	https://nptel.ac.in/courses/106106168
3	http://csis.pace.edu/~marchese/CS865/Lectures/Chap7/Chapter7fin.htm
4	https://nptel.ac.in/courses/106104182

MOOCs:

Resources No.	Website address
1	NPTEL / Swayam
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