Study & Evaluation Scheme

of

Bachelor of Computer Application

[Applicable for Batch 2021-24]

[As per CBCS guidelines given by UGC]

Approved in BOS	Approved in BOF	Approved in Academic Council
09/08/2021	18/08/2021	14/11/2021 Vide Agenda No 6.5.1

Quantum University, Roorkee
22 KM Milestone, Dehradun-Roorkee Highway, Roorkee (Uttarakhand)
Website: www.quantumuniversity.edu.in

Study & Evaluation Scheme
Study Summary

Name of the Faculty	Faculty of Computer Application
Name of the School	Quantum School of Technology
Name of the Department	Department of Computer Application
Program Name	Bachelor of Computer Application
Duration	3 Years
Medium	English

Evaluation Scheme

Type of Papers	Internal Evaluation (%)	End Semester Evaluation (%)	Total (%)
Theory	40	60	100
Practical/ Dissertations/Project Report/ Viva-Voce	40	60	100
Internal Evaluation Components (Theory Papers)			
Mid-Term Examination	60 Marks		
Assignment –I	30 Marks		
Assignment-II	30 Marks		
Attendance	30 Marks		
Internal Evaluation Components (Practical Papers)			
End Semester Evaluation (Practical Papers)			
ESE Quiz	40 Marks		
ESE Practical Examination	80 Marks		
Viva- Voce	20 Marks		

Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 5 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a) and b) of question Q1 to Q5 will be compulsory and each part carries 2 marks. Parts c), d) and e) of Q1 to Q5 Carry 8 marks each and the student may attempt any 2 parts.

Important Note:

1. *The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment Programme Outcomes (PO). A question paper must assess the following aspects of learning as planned for a specific course i.e Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based on mapped BL level complexity of the unit of the syllabus, which is the basis of CO attainment model adopted in the university.*

2. *Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*

3. *There shall be continuous evaluation of the student and there will be a provision of real time reporting on QUMS. All the assignments will evaluated through module available on ERP for time and access management of the class.*

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Program Structure – Bachelor of Computer Application

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Introduction

  Bachelor of Computer Application (BCA) is ideal for those who love computers and want to delve deeper into how they operate, software, hardware and related tools and technologies. So, let's explore more about this course, the career scope of BCA and see what it has to offer.

BCA Scope

Bachelor in Computer Application (BCA) is generally offered as a 3 year degree course that aims to impart to students with knowledge of software development and programming, Java, C++, computer networking and Database Management. Any individual with high school qualifications can apply for this course. There is an extensive scope of BCA in contemporary times as graduates can choose from a varied range of opportunities like web designing, computer programming, database administration, amongst others.

Further, as the global tech industry paces towards newer heights, the demand for software developers and programmers is only rising up. The immense BCA scope opens up a lot of opportunities for the students. One of the perks it offers is stream versatility. Even those students who opted for Arts or Commerce stream in high school can opt for a BCA degree and steer towards a career in website or app development and software designing which was a field only reserved for science students earlier.

Career Scope of BCA

For those who choose to directly explore job opportunities after completing their undergraduate degree, BCA is a skill-oriented course and thus getting a job is comparatively easier for graduates as compared to purely academic courses like BSc or B.Com. There are lucrative career opportunities in the private and public sector for BCA graduates. So, if you are wondering what to after BCA, here are some of the jobs that come under the scope of BCA:

1. Web Developer
2. Database Administrator
3. Software Developer
4. Software Developer

5. Computer Programmer

6. System Engineer

7. Computer Systems Analyst

8. System Administrator/ IT Administrator

9. Computer Scientist

Scope of BCA in the Government Sector

Apart from private sectors, completing a BCA degree opens up numerous opportunities in various Government sectors. They can get job offers like Probationary officer, Army and Navy, IAS, IPS, CBI, RRB and UPSC. There are several graduate-level entrance exams that are conducted where only BCA degree holders can apply for which grants entry into these Government sectors like UPSC, CDSE, SSC CGL, etc.

BCA Scope in India and Abroad

The IT sector is among the highest paying fields for BCA graduates in India and abroad. BCA scope is immense with lot of job opportunities. You will be eligible for entry level jobs or go for further studies such as MCA or MBA. From banks to game designing firms it is easy to find job if you have relevant knowledge and skills. Students can also work freelance or in big MNCs all over the world.

Major Employment Areas

Owing to the extensive BCA scope, graduates can choose from a plethora of sectors offering lucrative job opportunities. Here are the popular employment sectors for BCA graduates:

- Financial Institutions
- Banks
- Consultancies
- IT Companies
- Multimedia & Animation
- Graphic Design
- Actuaries
- Security & Surveillance
- Game Designing
- Software Development Companies

Curriculum (21-24) Version 2021

Quantum School of Technology

Bachelors of Computer Applications **PC: 01-03-11**

BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Foundation Core (FC)	11
2	Program Core (PC)	88
3	Program Electives (PE)	12
4	Open Electives (OE)	9
5	Internship Presentation	2
6	Value Added Programs (VAP)	5
7	Disaster Management*	2*
8	General Proficiency	5
	TOTAL NO. OF CREDITS	132

*Non-CGPA Audit Course

SEMESTER-WISE BREAKUP OF CREDITS

Sr.No.	CATEGORY	SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	SEM 6	TOTAL
1	Foundation Core	8	-	-	-	-	3	11
2	Program Core	9	17	18	19	9	16	88
3	Program Electives	-	-	-	-	6	6	12
4	Open Electives		3	3	3	-	-	9
5	Internship Presentation				1	1		2
6	VAP	1	1	1	1	1	-	5
7	Disaster Management*	2*						2*
8	General Proficiency	1	1	1	1	1		5
	TOTAL CREDITS	19	22	24	24	18	25	132

*Non-CGPA Audit Course
MINIMUM CREDIT REQUIREMENT = 132

SEMESTER 1

Course Code	Category	COURSE TITLE	L	T	P	C	VerVersion	Course Prerequisite
CA 3101	FC	Programming in C	3	0	0	3	1.0	Nil
CA 3102	PC	Discrete Mathematics	3	2	0	4	1.0	Nil
PS 3101	FC	Human Values & Ethics	2	0	0	2	1.0	Nil
CA 3104	PC	Open Source Software and Linux	3	2	0	4	1.0	Nil
EG 3103	FC	English Communication	2	0	0	2	1.0	Nil
CA 3141	FC	Programming in C-Lab	0	0	2	1	1.0	Nil
CA 3143	PC	Open Source Software and Linux Lab	0	0	2	1	1.0	Nil
CE 3101	FC	Disaster Management	2	0	0	2*	1.0	Nil
VP 3101	VP	Communication and professional skill I	0	0	2	1	1.0	Nil
GP3101	GP	General Proficiency	0	0	0	1		
		TOTAL	**15**	**4**	**6**	**19**		

*Non-CGPA Audit Course   **Contact Hrs: 25**

SEMESTER 2

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Pre-requisite
CA 3204	PC	Software Engineering	3	1	0	4	1.0	Nil
CA 3205	PC	Fundamentals of Data Structures	3	1	0	4	1.0	Nil
CA 3206	PC	Object Oriented Programming Using C++	3	1	0	4	1.0	Nil
CA 3242	PC	Hardware Maintenance Lab	0	0	2	1	1.0	Nil
CA 3244	PC	Data Structures Using Advance C Lab	0	0	4	2	1.0	Nil
CA 3243	PC	Object Oriented Programming Using C++ Lab	0	0	4	2	1.0	Nil
	OE	Open Elective I	3	0	0	3	1.0	Nil
VP 3201	VP	Value Added Program II	0	0	2	1	1.0	Nil
GP3201	GP	General Proficiency	0	0	0	1		
		TOTAL	**12**	**3**	**12**	**22**		

Contact Hrs: 27

Open Elective 1

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3011	OE	Carbon Emission & Control	3	0	0	3	1.0	Nil
CS3021	OE	Mining and Analysis of Big data	3	0	0	3	1.0	Nil
AG3011	OE	Ornamental Horticulture	3	0	0	3	1.0	Nil
BB3011	OE	Entrepreneurial Environment in India	3	0	0	3	1.0	Nil
JM3011	OE	Media Concept and Process (Print and Electronic)	3	0	0	3	1.0	Nil
HM3011	OE	Indian Cuisine	3	0	0	3	1.0	Nil
MB3011	OE	SAP 1	3	0	0	3	1.0	Nil
EG3011	OE	French Beginner A1	3	0	0	3	1.0	Nil
MT3011	OE	Elementary Robotics	3	0	0	3	1.0	Nil

SEMESTER 3

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CA 3301	PC	Programming In Java	3	2	0	4	1.0	CA 3203
CA3305	PC	Relational Database Management	3	0	0	3	1.0	Nil
CA 3303	PC	Digital Logic Fundamentals	3	2	0	4	1.0	Nil
CA 3304	PC	Operating System	3	0	0	3	1.0	Nil
CA 3340	PC	Programming In Java Lab	0	0	2	1	1.0	Nil
CA3341	PC	Relational Database Management Lab	0	0	2	1	1.0	Nil
CA3342	PC	Python Programming Lab	0	0	4	2	1.0	Nil
CA3370	FW	Internship Presentation	0	0	2	1	1.0	Nil
	OE	Open Elective II	3	0	0	3	1.0	Nil
VP3301	VP	Value Added Program III	0	0	2	1	1.0	Nil
GP3301	GP	General Proficiency	0	0	0	1		
		TOTAL	**15**	**4**	**12**	**24**		

Contact Hrs: 31

Open Elective II

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3013	OE	Environment Pollution and Waste Management	3	0	0	3	1.0	Nil
CS3023	OE	Big Data Analytics: HDOOP Framework	3	0	0	3	1.0	Nil
AG3013	OE	Organic farming	3	0	0	3	1.0	Nil
BB3013	OE	Establishing a New Business	3	0	0	3	1.0	Nil
JM3013	OE	Photo Journalism	3	0	0	3	1.0	Nil
HM3013	OE	Chinese Cuisine	3	0	0	3	1.0	Nil
MB3013	OE	SAP 3	3	0	0	3	1.0	Nil
EG3013	OE	French Intermediate B1	3	0	0	3	1.0	Nil
EG3002	OE	Report Writing	3	0	0	3	1.0	Nil

SEMESTER 4

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CA 3401	PC	Computer Networks	3	2	0	4	1.0	Nil
CA 3402	PC	Computer Organization	3	2	0	4	1.0	Nil
CA 3403	PC	Web Technology	3	2	0	4	1.0	Nil
CA 3405	PC	C#.Net	3	1	0	4	1.0	Nil
CA 3440	PC	Computer Networks Lab	0	0	2	1	1.0	Nil
CA 3442	PC	C#.Net Lab	0	0	2	1	1.0	Nil
CA 3441	PC	Web Technology Lab	0	0	2	1	1.0	Nil
	OE	Open Elective III	3	0	0	3	1.0	Nil
VP3401	VP	Value Added Program IV	0	0	2	1	1.0	Nil
GP3401	GP	General Proficiency	0	0	0	1		
		TOTAL	**15**	**7**	**8**	**24**		

All students are required to attend 04 to 06 weeks Industrial Training after 4th semester. This training will be evaluated and awarded in 5th semester.

Contact Hrs: 30

Open Elective III

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CE3015	OE	Hydrology	3	0	0	3	1.0	Nil
CS3025	OE	Data Science Models : Regression, Classification and Clustering	3	0	0	3	1.0	Nil
AG3015	OE	Musroom Cultivation	3	0	0	3	1.0	Nil
BB3015	OE	E-commerce	3	0	0	3	1.0	Nil
JM3015	OE	Media industry and Management	3	0	0	3	1.0	Nil
HM3015	OE	Italian Cuisine	3	0	0	3	1.0	Nil
MB3015	OE	SAP 5	3	0	0	3	1.0	Nil
EG3015	OE	French Advance C1	3	0	0	3	1.0	Nil
MT3015	OE	Robotic Industry 4.0	3	0	0	3	1.0	Nil

SEMESTER 5

Course Code	Category	COURSE TITLE	L	T	P	C	Version on	Course Prerequisite
CA 3501	PC	PHP and MYSQL Programming	3	0	0	3	1.0	Nil
EE 3503	PC	Mobile Technology	3	0	0	3	1.0	Nil
CA 3543	PC	MYSQL and PHP Programming Lab	0	0	2	1	1.0	Nil
EE 3547	PC	Lab on Mobile Technology	0	0	2	1	1.0	Nil
CA 3544	PC	Advanced Python Lab	0	0	2	1		
CA 3570	FW	Internship Presentation II	0	0	2	1	1.0	Nil
VP 3501	VP	Value Added Program V	0	0	2	1	1.0	Nil
	PE	Program Elective I	3	0	0	3	1.0	Nil
	PE	Program Elective II	3	0	0	3	1.0	Nil
GP3501	GP	General Proficiency	0	0	0	1		
		TOTAL	**12**	**0**	**10**	**18**		

Contact Hrs: 22

SEMESTER 6

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
CA 3601	PC	Intelligent Data Analytics	4	0	0	4	1.0	Nil
MA 3603	FC	Mathematics	3	0	0	3	1.0	Nil
CA 3640	PC	Project	10	0	0	10	1.0	Nil
CA 3641	PC	Seminar	0	0	3	2	1.0	Nil
	PE	Program Elective III	3	0	0	3	1.0	Nil
	PE	Program Elective IV	3	0	0	3	1.0	Nil
		TOTAL	**23**	**0**	**3**	**25**		

Contact Hrs: 26

PROGRAM ELECTIVES

Elective	Course Code	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
I	CA3503	Multimedia and Animation	3	0	0	3	1.0	Nil
	CA3504	IT Infrastructure Management	3	0	0	3	1.0	Nil
	CA3507	Data Compression Techniques & Algorithms	3	0	0	3	1.0	Nil
II	CA3505	Machine Learning Concepts	3	0	0	3	1.0	Nil
	CA3506	Cloud Computing Foundation	3	0	0	3	1.0	Nil
	CA3508	IT Application Security & Privacy	3	0	0	3	1.0	Nil
III	CA3602	E-Commerce	3	0	0	3	1.0	Nil
	CA3603	Cryptography and Network Security	3	0	0	3	1.0	Nil
	CA3606	Digital Image Processing & Analysis	3	0	0	3	1.0	Nil
IV	CA3604	Introduction to Cyber Law and Crimes	3	0	0	3	1.0	Nil
	CA3605	Introduction to Mobile Application Development	3	0	0	3	1.0	Nil
	CA3607	Introduction to Computer Vision	3	0	0	3	1.0	Nil

Contact Hrs: 32

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the B.C.A program:

 Core competency: Students will acquire core competency computer application and in allied subject areas.

Program/Discipline Specific Elective Course (DSEC):

Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic & advance knowledge and concepts of Computer Studies.

Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

Skilled project manager: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about technical project management, writing, planning, study of ethical standards and rules and regulations pertaining to technical project operation.

Ethical awareness/reasoning: A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

Value Added Course (VAC): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester I, II, III, IV, V semesters and two courses of Soft Skills in every Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

Skill Enhancement Course: This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Generic/Open Elective Course (OEC): Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in II, III, IV, V and IV semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Non-Credit CGPA : This is a compulsory course but audit that does not have any choice and will be of 3 credits. Each student of B.C.A Program has to compulsorily pass the Environmental Studies and Human values & professional Ethics and NSS.

C. PROGRAM OUTCOMES OF BCA.

PO-01	Computer Science Applications knowledge	Apply the knowledge of mathematical, science and computer programming to solve of computer software problems.
PO-02	**Problem analysis**	Identify, formulate, review research literature, analyze complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and computer software
PO-03	Development of solutions	Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO-04	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern software development and IT tools.
PO-05	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO-06	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the software development practice.
PO-07	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-08	Communication	Communicate effectively on complex software programming activities with the software development community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO-09	Life-Long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Program Specific Outcomes:

- **PSO1**-To pursue further studies to get specialization in Computer Science and Application, Economics, Mathematics, business administration.

- **PSO2**-To pursue the career in corporate sector can opt for MBA or MCA.

- **PSO3**-To Work in the IT sector as programmer, system engineer, software tester, junior programmer, web developer, system administrator, software developer etc.

Program Educational Objectives (PEO's)

- **PEO1.** To be well familiar with the concepts of Computer Applications for leading a successful career in industry or as entrepreneur or to pursue higher education.
- **PEO 2.** To develop techno-commercial skills for providing effective solutions to complex problems using domain knowledge of Computer Science and Applications
- **PEO 3.** To instill lifelong learning approach towards constantly evolving technologies with innovative and ethical mindset.

E. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

Role Play & Simulation: Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

Video Based Learning   (VBL) & Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In   fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

Field/Live Projects: The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance

students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) It will necessary for every student to take at least one MOOC Course throughout the programme.

b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.

d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.

e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

Special Guest Lectures (SGL) & Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

Industry Focused programmes: Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice-based insight to the students.

Special assistance program for slow learners & fast learners: write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners.

Induction program: Every year 3 weeks induction program is organized for 1st year students and senior students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

Mentoring scheme: There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

Competitive exam preparation: Students are provided with one class in every week for GATE/ Competitive exams preparation.

Extra-curricular Activities: organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

Career & Personal Counseling: - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the

students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

Participation in Flip Classes, Project based Learning(A2 Assignment), Workshops, Seminars & writing & Presenting Papers: Departments plan to organize the Flip Classes, Project based Learning(A2 Assignment), workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

Formation of Student Clubs, Membership & Organizing & Participating events: Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

Capability Enhancement & Development Schemes: The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

Library Visit & Utilization of QLRC: Students may visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

Detailed Syllabus (Semester wise /course wise)

SEMESTER 1 Year -1

CA-3101	Title: Programming in C	L T P C
		3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objective	To learn the fundamentals of computers .To understand the various steps in Program development .To learn to write programs using structured programming approach in C to solve problems.	
Expected Outcome	Upon completion of the course, the student should be able to Effectively and creatively solve a wide range of graphic design problems. Form effective and compelling interactive experiences for a wide range of audiences. Demonstrate the basic knowledge of Gain knowledge in using C language for solving problems.	
Unit No.	**Unit Title**	**No. of Hrs (Per Unit)**
Unit 1	**Basics of Computer**	7
History and Hardware – Computer Hardware, Bits and Bytes, Components, Programming Languages – Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software.		
Unit 2	**Fundamental of C Programming**	7
Introduction to C Programming- Identifiers, The main () Function, The printf () Function Programming Style – Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associatively, Declaration Statements, Initialization. Assignment – Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.		
Unit 3	**Control Flow and Looping**	7
Control Flow-Relational Expressions – Logical Operators: Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples. Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.		
Unit 4	**Functions and Arrays**	8
Modular Programming: Function and Parameter Declarations, Returning a Value, Local, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function. **Arrays & Strings:** One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices Strings: String Fundamentals, String Input and Output, String Processing, Library Functions.		
Unit 5	**Pointer, Structure and File Handling**	7
Pointers, Structures, Files : Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments. Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures,		
Text Books	1. KR Venugopal,.“Mastering C”,TMH 2. Y. kanetkar “Let us C” ,BPB Publication 3. E. Balagurusamy..“Programming in ANSI C” TMH	
Reference Books	1. Dennis Ritchie The C Programming Language” TMH	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studies on	09-08-2021	
Date of Approval by the Academic Council on	14-11-2021	

Course Outcome For CA 3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	understand the concept of hardware , software, and programming languages- low level & high level and OOPs concept.	2	S
CO2	understand the fundamentals of C programming like data types, operator and its precedence, associativity formatted outputs etc.	2	S
CO3	understand and implement the concept of control flow and looping.	2	Emp
CO4	understand and implement the concept of functions and arrays.	3	Emp
CO5	understand and implement the concept of pointer structure and file handling and apply these for real world problems.	3	Emp

CO-PO Mapping for CA 3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	1	2	1	1	2	2	2	2	2	2
CO 2	2	3	2	3	1	2	2	2	2	2	2	2
CO 3	3	2	1	2	1	2	1	2	2	2	2	2
CO 4	3	3	3	2	1	2	2	2	2	2	2	2
CO 5	2	3	3	2	2	3	2	3	3	3	3	3
Avg	2.6	2.6	2	2.2	1.2	2	1.8	2.2	2.2	2.2	2.2	2.2

CA 3102	Title: Discrete Mathematics	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objective	Write an argument using logical notation and determine if the argument is or is not valid. Demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.	
Expected Outcome	A number of recurring themes, and a set of general principles that have broad application to the field of computer science and discrete mathematics . The social, legal, ethical, and cultural issues inherent in the discipline of computing .	
Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit 1	Introduction	6
Variables, The Language of Sets, The Language of Relations and Function Set Theory: Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem		
Unit 2	Logic, Quantified Statements, Functions	7
The Logic of Compound Statements: Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions, Cardinality with Applications to Computability		
Unit 3	Number Theory and Methods of Proof	8
Elementary Number Theory and Methods of Proof: Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms		
Unit 4	Relations, Graph & Tree	7
Relations: Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations Graphs and Trees: Definitions and Basic Properties, Trails, Paths, and Circuits, Matrix Representations of Graphs, Isomorphism's of Graphs, Trees, Rooted Trees, Isomorphism's of Graphs, Spanning trees and shortest Paths		
Unit 5	Counting and Probability	8
Counting and Probability: Introduction, Possibility Trees and the Multiplication Rule, Possibility Trees and the Multiplication Rule, Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, Combinations with Repetition Allowed, Probability Axioms and Expected Value, Conditional Probability, Bayes' Formula, and Independent Events		
Text Books	1.Sussana S. Epp, Discrete Mathematics with Applications, Cengage Learning 2.Seymour Lipschutz ,Discrete Mathematics, Schaum's Outlines Series , Marc Lipson, Tata MCGraw Hill	
Reference Books	1. Kenneth H. Rosen , Discrete Mathematics and its Applications, Tata MCGraw Hill 2 B Kolman RC Busby, S Ross, Discrete mathematical structures, PHI	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studied on	09-08-2021	
Date of Approval by the Academic Council on	14-11-2021	

Course Outcome For CA 3102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concepts of set along with proofs to prove equality in sets. Various operations on sets, Principle of inclusion and exclusion, and various properties of Relation.	2	S
CO2	Students should be able to understand propositions and then would be able to find out the validity of the argument.	2	Emp
CO3	Students should be able to get complete knowledge of number theory, induction and various operations on integers.	2	S
CO4	Students should be able to understand the concepts of Graphs, Trees and related theorems along with various related algorithms. They will also learn Relation concepts and properties	3	Emp
CO5	Students should be able to solve the problems of Permutation, Probability and Combination. They will learn the concepts of counting theory and techniques.	2	Emp

CO-PO Mapping for CA 3102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PEO1	PEO1	PEO1	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	3	3	2	3	2	3	2	3	2	2	3
CO 2	3	3	3	3	2	3	2	2	2	3	2	1
CO 3	3	3	2	3	2	2	3	3	3	3	2	2
CO 4	2	2	3	2	2	3	3	2	3	2	3	2
CO 5	3	2	3	3	1	1	3	2	3	3	2	3
Avg	2.8	2.6	2.8	2.6	2	2.2	2.8	2.2	2.8	2.6	2.2	2.2

PS 3101	**Title: Human Values & Ethics**	**L T P C** **2 0 0 2**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To facilitate the development of a holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the human reality and the rest of existence	
Expected Outcome	This course will make the students aware and sensitive to value systems in real life situations. It will help them to discriminate between ephemeral and eternal value and to discriminate between essence and form	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Introduction of Value Education**	5
1. Understanding the need, basic guidelines, content and process of Value Education 2. A look at basic Human Aspirations: Self Exploration–its content and process		
Unit II	**Understanding Harmony - Harmony in Myself!**	5
1. Thoughtful human being in harmony; as a co-existence of the sentient, attitude and its importance in relationship. 2. Understanding the needs, characteristics and activities of Self ('I')		
Unit III	**Understanding Harmony in the Family and Society**	5
1. Harmony in the family; values in human relationships; meaning of Nyaya , Trust (Vishwas) and Respect (Samman) as the foundation values of relationships. 2. Harmony in society:Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals.		
Unit IV	**Understanding Harmony in the Nature and Existence**	4
1. Understanding the harmony in Nature: Interconnectedness among the four orders of nature- recyclability and self-regulation in nature 2. Natural perception of harmony at all levels of existence		
Unit V	**Understanding Professional Ethics**	5
Competencies in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems.		
Text Books	1.R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi,	
Reference Books	1.A.N. Tripathy , Human Values, New Age International Publishers. 2.B L Bajpai,, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. B P Banerjee, Foundations of Ethics and Management, Excel Books	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	09-08-2021	
Date of approval by the Academic Council	14-11-2021	

Course Outcome For PS 3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society	2	S
CO2	Students should be able to Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	2	S
CO3	Students should be able to understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.	3	Emp
CO4	Students should be able to understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	2	Emp
CO5	Students should be able to distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	2	S

CO-PO Mapping for PS 3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	2	2	2	3	3	1	3	3	2
CO 2	1	2	3	2	3	2	2	1	3	2	2	2
CO 3	2	2	2	3	2	3	3	3	2	1	3	2
CO 4	2	3	2	2	2	3	2	3	3	3	3	3
CO 5	3	2	3	3	2	2	2	2	3	2	2	2
Avg	2.2	2.2	2.4	2.4	2.2	2.4	2.4	2.4	2.4	2.2	2.6	2.2

EG 3103	Title: English Communication	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To impart basic English communication skills to the student-writing, speaking, reading and listening.	
Expected Outcome	The student will gain a sound understanding of the basics of English which will help him in social and professional situations.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Fundamentals of Communication**	**5**
	Communication Process; Definition, Importance; Forms of Communication, Channels of Communication; Barriers to Communication: Qualities of a Good Communicator.	
Unit II	**Types of Communication**	**5**
	Verbal and Non-verbal Communication: Audio-Visual Communication; Effective speaking; Types of Non-verbal communication- Kinesics, Proxemics, Chronemics, Paralanguage.	
Unit III	**Listening Skills**	**4**
	Definition and Importance; Types of Listening Skills; Intelligent Listening; Barriers to Listening and overcoming Barriers; SWOT Analysis.	
Unit IV	**Writing Skills**	**5**
	Use of Grammar; Business Correspondence; Presentations; Report Writing, Project; Notice and Circulars.	
Unit V	**Use of Communication Skills**	**5**
	Basics of Phonetics; Presentation Skills- Dos & Don'ts; Extempore, Debate, Role Play, Interview, Group Discussion.	
Suggested Reference Books	1. P K Agrawal and A K Mishra, Business Communication, Sahitya Bahwan Publication. 2. Vinod Mishra and Narendra Sukla, Business Communication, SBPD Publishing House.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	09-08-2021	
Date of approval by the Academic Council	14-11-2021	

Course Outcome For EG 3103

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concept of communication skills	1	S
CO2	Students should be able to increase self-awareness about English language.	2	S
CO3	Students should be able to develop public speaking abilities.	2	Emp
CO4	Students should be able to present each and everything in correct manner.	2	Emp
CO5	Students should be able discuss the concept of barriers to communication.	3	Emp

CO-PO Mapping for EG 3103

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	2	2	2	1	2	3	3	3	2
CO 2	3	3	3	2	3	2	2	3	1	2	2	2
CO 3	2	2	2	3	2	3	3	1	2	3	3	2
CO 4	2	3	2	2	2	3	3	2	2	1	2	3
CO 5	3	2	2	3	2	2	3	3	3	2	3	2
Avg	2.4	2.4	2.2	2.4	2.2	2.4	2.4	2.2	2.2	2.2	2.6	2.2

CA 3141	Title: Programming in C-Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Learning objectives is to improve confidence in technology use and increased awareness of opportunities afforded to individuals with computer application skills.	
Expected Outcome	To learn and practice the basic concept of C language	

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List of Experiments

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1. Programs using I/O statements and expressions.

2. . Programs using decision-making constructs.

3. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)

4. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.

5. Check whether a given number is Armstrong number or not?

6. Populate an array with height of persons and find how many persons are above the average height.

7. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.

8. Given a string ―a$bcd./fg‖ find its reverse without changing the position of special characters. (Example input:a@gh%;j and output:j@hg%;a)

9. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.

10. From a given paragraph perform the following using built-in functions:
    a. Find the total number of words.
    b. Capitalize the first word of each sentence.
    c. Replace a given word with another word.

11. Solve towers of Hanoi using recursion.

12. Sort the list of numbers using pass by reference.

13. Generate salary slip of employees using structures and pointers.

14. Compute internal marks of students for five different subjects using structures and functions.

15. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3141

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to learn a programming language.	2	S
CO2	Students should be able to learn problem solving techniques.	3	Emp
CO3	Students should be able to write programs in C and to solve the problems.	2	Emp

CO-PO Mapping for CA 3141

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	3	2	3	1	2	2	2	3	3	2
CO 2	3	3	2	3	2	2	2	2	2	2	2	1
CO 3	2	2	2	1	2	3	3	3	3	2	3	3
Avg	2.67	2.33	2.33	2.00	2.33	2.00	2.33	2.33	2.33	2.33	2.67	2.00

CA 3104	Title: Open source software and Linux	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objective	The Community's goal is that Open Office becomes the product of choice for users of office software, on any major platform in any language. However, it is recognized that office suites are a mature product, and so users with a product currently installed on their PCs will probably be quite comfortable with it.	
Expected Outcome	OpenOffice.org adopted a development guideline that future versions of OpenOffice.org would run on free implementations of Java.	
Unit No.	**Unit Title**	**No. of Hrs**
Unit 1	**Introduction To LINUX**	**7**

What Is Linux? -The Problems with Windows -The Benefits of Linux – Proprietary Software and the GPL- GNU and Linux Together- Different Flavors of Linux- Who Uses Linux?- Understanding How Linux Differs from Windows- Using Ubuntu

Unit 2	**Bash Shell**	**7**

What Is the BASH Shell? -Working with Files-Listing Files-Copying Files and Directories -Moving Files and Directories -Deleting Files and Directories –Changing and Creating Directories-Real Files and Virtual Files. -Users and File Permissions - The File System Explained -File Searches -Using the find Command -Using the locate Command -Using the where is Command-File Size and Free Space –Viewing File Sizes -Finding Out the Amount of Free Space

Unit 3	**Writer — The Word Processor**	**7**

 Creating a Document -Opening a Document -Laying Out the Page-Setting paper size, margins, and orientation - Creating headers and footers -Numbering pages –Entering and Editing Text-Modifying text-Moving and copying text -Finding and replacing text - Correcting mistakes automatically-Printing -Adding character to your characters - Planning Your Paragraphs-Aligning paragraphs -Spacing your lines -Making Lists - Bulleting lists-Numbering lists-Using a style -Creating a style - tables and columns

Unit 4	**CALC — The Spreadsheet**	**7**

Creating a Spreadsheet -Inputting Your Data -Entering your data -Editing your data - Filling cells automatically - Managing Columns and Rows-Copying, pasting, cutting, dragging, and dropping your cells -Adding the Art - Formula Basics-Adding, Subtracting, and More -Adding and other arithmetic -Adding with the Sum function - Rocketing into Orbit with Functions Using the Auto Pilot: Functions dialog box –Editing functions -Entering functions manually -Copying and pasting formulas –Creating formula arrays

Unit 5	**IMPRESS — THE PRESENTATION**	**8**

 Creating a Presentation -Opening an existing presentation -Adding Slides –Adding text to a slide -Saving Your Presentation for Posterity - Making Presentations Picture Perfect -Adding Images -Clipping art -Drawing objects -Coloring Backgrounds - Creating a plain-colored background -Creating a gradient background -Hatching a background -Using a bitmap image as a background -Creating 3-D text-Inserting 3-D objects -Animating Impressively -Using Text Effects Effectively -Creating Animation Effects

Text Books	1. Keir Thomas and Andy Channelle with Jaime Sicam , "Beginning Ubuntu Linux" , Apress 2. GurdyLeete, Ellen Finkelstein, and Mary Leete, "Openoffice.org for dummies", Wiley Publishing, Inc
Reference Books	1. OpenOffice.org BASIC Programming Guide, Andrew Pitonyak's Macro Book
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3104

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use , for more than One)
CO1	Students should be able to use open source software like Libre office	2	S
CO2	Students should be able to use various Linux command	2	Emp
CO3	Students should be able to use MS word software	2	S

CO-PO Mapping for CA 3104

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	3	2	3	3	2	2	3	1	3	2	3
CO 2	3	1	1	2	2	3	2	2	3	1	3	2
CO 3	2	3	3	1	2	2	2	2	3	2	2	2
Avg	2.3	2.3	2.0	2.0	2.3	2.3	2.0	2.3	2.3	2.0	2.3	2.3

CA 3143	Title: Open Source Software and Linux Lab	L T P C
		0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	Learn about the accessibility features available within the Open Office suite of applications and how to customize them	
Expected Outcome	• Students should be able to use open sourse software like Libre office • Students should be able to use various Linux command • Students should be able to use MS word software	

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List of Experiments

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1. Installation of Linux using Virtual Box

2. Installation of Open Source software in Linux OS.

3. Executing Shell level basic commands.

4. Create files and apply permissions on files using terminal.

5. Download unformatted file "prax-en.txt" and Open downloaded file, save your file in Open Office format

6. Apply paragraph Style "Text Body" & Modify paragraph style "Text Body"

7. Format chapter headings, Activate chapter numbering, Mark chapter headings

8. Format first page & Insert new page after title page

9. Insert table of contents & Modify table of contents, Format table of contents

10. Insert new page after table of contents & Add page numbering

11. Prepare style First page, Apply style First Page, Prepare style Default Page

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	14-05-2022
Date of approval by the Academic Council	20-10-2022
14-05-2022	14-05-2022

Course Outcome for CA 3143

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to use open source software like Libre office	2	S
CO2	Students should be able to use various Linux command	2	Emp
CO3	Students should be able to use MS word software	2	S

CO-PO Mapping for CA 3143

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes			Program Educational Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PEO 1	PEO 2	PEO 3
CO 1	2	0	2	0	0	0	2	0	2	2	2	2	2	2	1
CO 2	1	0	1	0	0	0	2	0	2	2	2	2	1	1	2
CO 3	2	0	2	0	0	0	2	0	2	2	2	2	3	2	2
Avg	1.25	0	1.25		0	0	0	1.5	0	1.5	1.5	1.5	1.5	2	1.66	1.66

CE 3101	Title: Disaster Management	L T PC 2 0 0 2
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.	
Expected Outcome	Enhance the knowledge by providing existing models in risk reduction strategies to prevent major causalities during disaster.	
Unit No.	**Unit Title**	**No. of hours per Unit)**
Unit: 1	**Introduction on Disaster**	5
Different Types of Disaster : A) Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc B) Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail and Road), Structural failures(Building and Bridge), War and Terrorism etc. Causes, effects and practical examples for all disasters.	
Unit II	**Risk and Vulnerability Analysis**	4
Risk: Its concept and analysis 2. Risk Reduction 3. Vulnerability: Its concept and analysis 4. Strategic Development for Vulnerability Reduction	
Unit III	**Disaster Preparedness**	5
Disaster Preparedness: Concept and Nature . Disaster Preparedness Plan Prediction, Early Warnings and Safety Measures of Disaster. Role of Information, Education, Communication, and Training, . Role of Government, International and NGO Bodies. . Role of IT in Disaster Preparedness. Role of Engineers on Disaster Management.	
Unit IV	**Disaster Response**	5
Introduction Disaster Response Plan Communication, Participation, and Activation of Emergency Preparedness Plan Search, Rescue, Evacuation and Logistic Management Role of Government, International and NGO Bodies Psychological Responseand Management (Trauma, Stress, Rumorand Panic). Relief and Recovery Medical Health Response to Different Disasters	
Unit V	**Rehabilitation, Reconstruction and Recovery**	5
Reconstruction and Rehabilitation as a Means of Development. Damage Assessment Post Disaster effects and Remedial Measures. Creation of Long-term Job Opportunities and Livelihood Options, Disaster Resistant House Construction Sanitation and Hygiene Education and Awareness, Dealing with Victims' Psychology, Long-term Counter Disaster Planning Role of Educational Institute.	
Text Books	1. Bhattacharya, Disaster Science and Management, McGraw Hill Education Pvt. Ltd.	

Reference Books	1. Dr. MrinaliniPandey, Disaster Management, Wiley India Pvt.Ltd. 2. Jagbir Singh, Disaster Management: Future Challenges and Opportunities, KW Publishers Pvt. Ltd.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use , for more than One)
CO1	Understand the basic concepts of disasters and its relationships with development.	2	S
CO2	Understand the approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.	2	S
CO3	Understand the Medical and Psycho-Social Response to Disasters.	2	S
CO4	Prevent and control Public Health consequences of Disasters.	2	S
CO5	Awareness of Disaster Risk Management institutional processes in India.	2	S

CO-PO Mapping for CA 3101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	1	2	1	1	2	2	2	2	2	2
CO 2	2	3	2	3	1	2	2	2	2	2	2	2
CO 3	3	2	1	2	1	2	1	2	2	2	2	2
CO 4	3	3	3	2	1	2	2	2	2	2	2	2
CO 5	2	3	3	2	2	3	2	3	3	3	3	3
Avg	2.6	2.6	2	2.2	1.2	2	1.8	2.2	2.2	2.2	2.2	2.2

SEMESTER 2 Year -1

CA 3204	Title: Software Engineering	L	T	P	C
		3	1	0	4
Version No.	1.0				
Course Prerequisites	Nil				
Objective	To understand the best practices in software engineering and to develop the neces-sary skills to handle software projects in a principled way.				
Expected Outcome	After the completion of this course, the students will be able to understand the ways of Software Development, Designing & Testing.				
Unit No.	Unit Title	No. of Hrs (Per Unit)			
Unit I	Introduction to Software Engineering	8			
Introduction to Software Engineering, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models, Software Myths					
Unit II	Software Requirements Definition	7			
The software requirements specifications (SRS), formal specifications techniques, characteristics of a good SRS,SQA					
Unit III	Software Design and Implementation Issue	7			
Fundamental design, concept design notations, design techniques, structured coding techniques coding styles, documentation guidelines.					
Unit IV	Fundamental of Software Testing	7			
What is Testing, Testing Approaches, Testing Principles, Testing Challenges ,Types of Testing					
Unit V	Software Maintenance	7			
Software Maintenance Overview, Cost of Maintenance, Software Re- Engineering, Reverse Engineering, Software Maintenance					
Text Books	1. Software Engineering – A Practitioner's Approach by RS Pressman, TataMcGraw Hill Publishers, New Delhi 2.Software Engineering by Rajib Mall, PHI Publishers, New Delhi				
Reference Books	1.In Integrated Approach to Software Engineering By PankajJalote, Narosa Publication House 2.Software Engineering ,Sangeetasabarwal ,New Age International , New Delhi				
Mode of Evaluation	Internal and External Examinations				
Recommendation by Board of Studies on	09-08-2021				
Date of approval by the Academic Council	14-11-2021				

Course Outcome For CA 3204

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Understand about Software Engineering and SDLC (Software development life cycle).	2	S
CO2	Understand about the SRS and Characteristics of SRS	2	S
CO3	Understand about various software designing techniques and implementation issues.	2	Emp
CO4	Understand about the different types of software testing techniques	3	Emp
CO5	Understand about the software maintenance	3	Emp

CO-PO Mapping for CA 3204

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	1	1	2	3	2	2	2	2	2	3
CO 2	2	1	2	1	3	2	1	3	2	1	3	1
CO 3	2	2	2	2	1	3	3	2	2	2	2	2
CO 4	3	3	3	2	2	2	2	2	3	3	2	3
CO 5	3	3	3	3	3	2	3	2	3	3	2	3
Avg	2.4	2.2	2.2	1.8	2.2	2.4	2.2	2.2	2.4	2.2	2.2	2.4

CA 3205	Title: **Fundamentals of Data Structures**	L	T	P	C
		3	1	0	4

Version No.	1.0
Course Prerequisites	Nil
Objective	To introduce the basics of C programming language To introduce the concepts of ADTs and linear data structures .To introduce the concepts of Sorting and Searching techniques. familiarize the concepts of Hashing and Sets
Expected Outcome	Upon completion of the course, the student should be able to: Implement data structures using C language. Solve the problem using linear and non linear data structures.Analyze and implement hashing techniques that solves in linear time.

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit 1	**Introduction**	11
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.		
Unit 2	**Stack**	9
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.		
Unit 3	**Trees**	9
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.		
Unit 4	**Graphs**	9
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.		
Unit 5	**Searching**	10
Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees . Hashing: Hash Function, Collision Resolution Strategies Storage Management: Garbage Collection and Compaction.		

Text Books	1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, DelhiIndia.
Reference Books	1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India. 2. A.K. Sharma ,Data Structure Using C, Pearson Education India. 3. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
Mode of Evaluation	Internal and External Examinations

Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3202

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to explain the data structures and its various types. Different operations to be studied wrt arrays and linked list.	2	S
CO2	Students should be able to explain and implement stacks and queues and their various operations .	2	Emp
CO3	Students should be able to explain and implement trees and its types with their traversals.	3	Emp
CO4	Students should be able to explain and implement graphs ,trees and also various graph matrices and understand the concept of graph traversals.	3	Emp
CO5	Students should be able to analyze and study various search algorithms.	3	Emp

CO-PO Mapping for CA 3202

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	2	3	3	3	2	3	2	2	2
CO 2	2	3	3	3	1	2	3	3	2	2	2	2
CO 3	3	3	3	3	2	2	3	2	3	3	1	3
CO 4	3	2	2	2	3	3	2	3	3	2	3	3
CO 5	3	3	3	3	2	2	3	2	2	3	3	3
Avg	2.6	2.6	2.6	2.6	2.2	2.4	2.8	2.4	2.6	2.4	2.2	2.6

CA 3206	Title: Object Oriented Programming Using C++	L	T	P	C
		3	1	0	4
Version No.	1.0				
Course Prerequisites	Nil				
Objective	This course provides an introduction to object oriented programming (OOP) using the Java programming language .Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm.				
Expected Outcome	Students who complete the course will have demonstrated the ability to do the model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism.				
Unit No.	**Unit Title**	**No. of Hrs (Per Unit)**			
Unit 1	**Introduction**	8			
What is object oriented programming? Why do we need object oriented. Programming characteristics of object-oriented languages C and C++. C++ Programming basics: Output using Cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions.					
Unit 2	**Functions**	12			
Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference. **Object and Classes:** Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes.					
Unit 3	**Arrays and string arrays fundamentals**	9			
Arrays of object, string, The standard C++ String class **Operator overloading:** Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.					
Unit 4	**Inheritance**	9			
Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation: Classes within classes, inheritance and program development.					
Unit 5	**Pointer & Virtual Function**	10			
Addresses and pointers. The address of operator and pointer and arrays. Pointer and Faction pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers. Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.					
Text Books	Herbert Schildt: The Complete Reference C++, Tata McGraw Hill, .				
Reference Books	1. Robert Lafore ,Object Oriented Programming in C++ , Techmedia Publication. 2. Saurav Sahay, Object Oriented Programming in C++ Oxford University Press.				
Mode of Evaluation	Internal and External Examinations				
Recommended by Board of Studied on	09-08-2021				
Date of Approval by the Academic Council on	14-11-2021				

Course Outcome For CA 3203

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the basics of Object Oriented programming .Learn the programming basics of C++.	2	S
CO2	Students should be able to understand the concept of Classes, Objects,Polymorphism, Inheritance using C++.	2	Emp
CO3	Students should be able to understand the fundamentals of Arrays and Strings using C++.	2	Emp
CO4	Students should be able to uderstand and implement the concept of Inheritance using C++ .	3	S
CO5	Students should be able to apply the concept of pointer and virtual function in complex programming situations.	3	Emp

CO-PO Mapping for CA 3203

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	3	2	2	2	3	2	2	2	2
CO 2	2	1	2	1	3	3	2	2	2	2	2	2
CO 3	2	2	2	3	2	1	2	2	2	3	3	2
CO 4	2	3	3	2	2	2	2	3	2	2	2	2
CO 5	3	3	3	2	2	2	3	2	3	3	3	3
Avg	2.2	2.2	2.4	2.2	2.2	2	2.2	2.4	2.2	2.4	2.4	2.2

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CA 3242	**Title: Hardware Maintenance Lab**	L T P C 0 0 2 1
Version No.	**1.0**	
Course Prerequisites	NIL	
Objectives	The main objective of the Lab is to provide the students the knowledge of computer hardware , the processors , memories, motherboard, different add on cards and other peripherals devices. Most important objective is to impart knowledge about the trouble-shooting and fault finding the computers and the peripherals	
Expected Outcome	On Completion of this course, students are able to develop skills to impart practical knowledge in real time solution. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.	

<div align="center">

List of Experiments

</div>

1. Different hardware components of a computer and their troubleshooting.

2. Different peripherals, their performance and cost characteristics.

3. Installation of different operating system and their capabilities

4. Installation of commonly used software like jdk, netbeans , turbo c, code block etc.

5. Networking, network topologies, and installation of LAN.

6. To study about SMPS.

7. To study about UPS.

8.   To study about Motherboard of computer.

Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3242

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Understand about the different hardware components of an computer and troubleshooting of computer.	**2**	**S**
CO2	Able to install different types of operating system and application software.	**2**	**S**
CO3	Understand about the SMPS, UPS , Motherboard etc.	**2**	**S**

CO-PO Mapping for CA 3242

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	3	2	3	3	2	2	2	3	2	2
CO 2	2	3	2	3	2	2	2	2	2	2	2	3
CO 3	3	2	2	3	3	2	3	3	2	2	2	2
Avg	2.7	2.3	2.3	2.7	2.7	2.3	2.3	2.3	2.0	2.3	2.0	2.3

CA 3244	Title: Data Structures Using Advance C Lab	L T P C 0 0 4 2
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.	
Expected Outcome	Be able to design and analyze the time and space efficiency of the data structure · Be capable to identity the appropriate data structure for given problem · Have practical knowledge on the applications of data structures	
List of Experiments		

1. Write a C program to implement the following using an array a) Stack ADT b) Queue ADT.

2. Write a C program to implement the following using a singly linked list a. Stack ADT b. Queue ADT.

3. Write C Program to implement the DEQUE (double ended queue) ADT using arrays.

4. Write a C program to perform the following operations: a) Insert an element into a binary search tree. b) Delete an element from a binary search tree. c) Search for a key element in a binary search tree.

5. Write a C program that use recursive functions to traverse the given binary tree in a) Preorder b) Inorder and c) Postorder.

6. Write a C program that use non –recursive functions to traverse the given binary tree in a) Preorder b) Inorder and c) Postorder

7. Write C programs for the implementation of BFS and DFS for a given graph.

8. Write C programs for implementing the following sorting methods: a) Merge Sort b) Heap Sort.

9. Write a C program to perform the following operations. a) Insertion into a B-tree b) Deletion from a B-tree.

10. Write a C program to perform the following operations. a) Insertion into a AVL-tree b) Deletion from a AVL-tree.

11. Write a C Program to implement all the functions of Dictionary (ADT) using hashing.

12. Write a C Program for implementing Knuth-Moris-Pratt pattern matching algorithm.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021

Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3244

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to learn about data structures like array, stack, queues and linked list.	2	Emp
CO2	Students should be able to Learn about how to insertion, deletion and traversing operations on data structures.	3	Emp
CO3	Students should be able to Learn about how to Compare various searching and sorting techniques.	3	S

CO-PO Mapping for CA 3244

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	3	3	3	2	2	3	3	3	3	3
CO 2	3	3	2	3	3	2	2	2	3	2	1	3
CO 3	3	2	2	1	2	3	2	2	2	1	2	2
Avg	2.7	2.3	2.3	2.3	2.7	2.3	2.0	2.3	2.7	2.0	2.0	2.7

CA 3243	Title: **Object Oriented Programming Using C++ Lab**	**L T P C** **0 0 4 2**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To make students able to learn basics of object oriented programming.,Students will learn to write program using classes and objects. Students will try to implement basic oops features using C++ programming.	
Expected Outcome	• Student should be able to implement the concept of oops. • Student should be able to use class and object in c++. • Student should be able to test different strings for their comparision	

List of Experiments

1. Using the concept of function overloading Write function for calculating the area of triangle, circle and rectangle.
2. Write a function power to raise a number m to power n. The function takes a double value for m andin value for n. Use default value for n to make the function to calculate squares when this argument is omitted.
3. Create a class TIME with members hours, minutes, and seconds. Take input, add two time objects passing objects to function and display result.
4. Write a program for multiplication of two matrices using OOP.
5. Create a class Student which has data members as name, branch, roll no, age, sex, marks in five subjects.
6. Display the name of the student and his percentage who has more than 70%.Use array of objects.
7. Write a program to enter any number and find its factorial using constructor.
8. Write a program to perform addition of two complex numbers using constructor overloading. The first constructor which takes no argument is used to create objects which are not initialized, second which takes one argument is used to initialize real and imaginary parts to equal values and third which takes two argument is used to initialized real and imaginary to two different values.
9. Write a program to generate a Fibonacci series using copy constructor.
10. Write a program to demonstrate the use of friend function with Inline assignment.
11. Write a program to find the greatest of two given numbers in two different classes using friend function.
12. Write a program to find the sum of two numbers declared in a class and display the numbers and sum using friend class.
13. Create a class person and two drive classes employee and students, inherited from class person. Now create a class manager which is derived from two base classes employee and students. Show the use of virtual base class.

Mode of Evaluation	Internal and External Examinations

Recommendation by Board of Studies on	28-07-2020
Date of approval by the Academic Council	13-09-2020

Course Outcome For CA 3243

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student should be able to implement the concept of oops.	2	Emp
CO2	Student should be able to use class and object in c++.	3	Emp
CO3	Student should be able to test different strings for their comparision	3	S

CO-PO Mapping for CA 3243

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes			Program Educational Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PEO 1	PEO 2	PEO 3
CO 1	3	2	2	2	3	1	2	2	2	1	1	2	2	2	2
CO 2	2	2	2	3	2	2	2	2	2	2	2	1	2	2	2
CO 3	3	2	2	3	3	2	3	3	2	2	2	2	2	2	3
Avg	2	2	2	2	2	1.25	1.75	1.75	1.5	1.25	1.25	1.25	2	2	2.33

SEMESTER 3 Year -2

CA 3301	Title: Programming in JAVA	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objective	The main objective of this course is to provide a straight forward way for the students to get their minds around Java and object-oriented programming. It also helps the students to get hands on experience on Java and to develop the cross platform applicat ions. This course covers all the necessary topics that any students require to create an application in Java.	
Expected Outcome	• Student shoul be able to understand the basics of Java, JDK, JVM, JRE and get to understand the OOPs concepts. • Studentsshould be able to create class, object, constructor, packages and polymorphism. • Students should be able to understand and implement the collection, framework, map, vector. • Students should be able to understand and implement exception handling and file handling. • Students should be able to understand Applet, AWT and Swing Programming.	
Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Introduction of Java	11
An Introduction to Java: Java Platform, Buzzwords, Short History on Java, Installing JDK, Setting the PATH. Fundamental Programming Structures: A Simple Java program, Data Types, Variables, Operators, Control Flow, Arrays, Objects and Classes: Introduction to Object Oriented Programming, Defining Your Own class, Introducing Methods, Method Overloading, Constructors, Argument Passing Mechanism, Object Destruction and Finalize, Understanding static.		
Unit II	Classes and Objects	11
Inheritance: Simple, Multilevel, Interfaces, Abstract classes and methods, Implementation of Polymorphism ,Method Overloading, Method Overriding, Nested and Inner classes. Modifiers and Access Control ,Packages-Packages Concept, Creating user defined packages, Java Built in packages, java.lang->math, java.util->Random, Date, Hashtable, Wrapper clas- ses		
Unit III	Collection	8
Collection Framework. ,Interfaces- Collection- List- Set- SortedSet- Enumeration- Iterator - ListIterator, Classes-LinkedList- ArrayList- Vector- HashSet- TreeSet- Hashtable Working with maps, Map interface, Map classes-HashMap- TreeMap		
Unit IV	File and Exception Handling	9
Exception: Exception types, Using try catch and multiple catch, Nested try, throw , throws and finally ,Creating user defined Exceptions, File Handling: Stream, ByteStream Classes, CharacterStream Classes, File IO basics, File op- erations, Creating file, Reading file(character, byte), Writing file (character, byte)		
Unit V	Applet, AWT and Swing Programming	9

Applet: Introduction, Types applet, Applet Life cycle, Creating applet, Applet tag, Applet Classes,Color- Graphics-Font , AWT: Components and container used in AWT, Layout managers, Listeners and Adapter classes, Event Delegation model Swing: Introduction to Swing Component and Container Classes

Text Books	1.Programming with JAVA - E Balgurusamy
Reference Books	1. The Complete Reference – JAVA Herbert Schildt 2. Core java –II By Cay S. Horstmann and Gary Cornell 3. Compete Reference J2EE – Jim Keogh
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3301

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use , for more than One)
CO1	Student should be able to understand the basics of Java, JDK, JVM, JRE and get to understand the OOPs concepts.	2	S
CO2	Students should be able to create class, object, constructor, packages and polymorphism.	2	Emp
CO3	Students should be able to understand and implement the collection, framework, map, vector.	3	Emp
CO4	Students should be able to understand and implement exception handling and file handling.	3	Emp
CO5	Students should be able to understand Applet, AWT and Swing Programming.	2	S

CO-PO Mapping for CA 3301

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	3	2	2	2	3	2	2	2	2	2
CO 2	2	2	2	2	3	3	3	3	3	2	2	2
CO 3	3	2	2	2	2	2	3	2	2	3	2	3
CO 4	3	3	2	3	1	2	2	2	2	3	2	3
CO 5	3	3	2	3	3	2	2	2	3	3	3	3
Avg	2.6	2.4	2.2	2.4	2.2	2.2	2.6	2.2	2.4	2.6	2.2	2.6

| CA 3305 | Title: Relational Database Management | L | T | P | C |
		3	0	0	3
Version No.	1.0				
Course Prerequisites	Nil				
Objective	The student should be made to distinguish between different models of organizing, storing and use of data,to apply specific SQL statement on relational tables as per requirements				
Expected Outcome	• Students should be able to understand about the database,database management system and comparison between DBMS and file oriented. • Students should be able to understand and design about RDBMS, EF Codd rules and mapping of ER diagrams. • Student should be able understand about database normalization and its working with SQL • Students should be able to understand about object modelling and database designing. • Students should be able to understand about transactions processing and various concurrency control techniques.				

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Introduction- Database And Database Management Systems**	**10**
	History of Database Management Systems, Characteristics of DBMS, Meaning and Definition of Database objectives of database, advantages of database and disadvantages of traditional file environment systems, Designing Databases-Hierarchical Data model- Network Data model- and Relational Data models-Database trends, Introduction to Relational Algebra	
Unit II	**Relational Database [RDBMS]**	**9**
	Relational Database [RDBMS]: The Relational Database Model-Techniques Components of Relational Model- Definition of Relational Terms- Features of RDBMS CODD 12 rules for a fully RDBMS. Relational implementation Primary and Foreign Keys- Relationships in the relational model Introduction to ER Model- one-to-one, one to- many, many to many relationship- Examples of Data definition language	
Unit III	**Normalization and SQL**	**10**
	Queries - Maintaining Integrity-Defining Data Integrity- Integrity Rules- Relational Integrity Rules- Referential Integrity- Entity Integrity- Domain Integrity- Entity Integrity User-defined Integrity- Integrity Constraints- Domain Constraints- Normalization -Benefits of normalization- Functional Dependency and Determinants, Canonical cover, Introduction to Normalization-INF, 2NF, 3NF, Review of Normal Forms-Structured Language Query [SQL]- Characteristics of SQL. Types of SQL [DCL- DDL- DML]- Basic queries in SQL Single table-Multi table Retrievals- Nested queries - Deletion- Insertion- and Update in SQL.	
Unit IV	**Object Modeling and Database Design**	**10**
	Introduction- Types of Data Models (Conceptual Logical and Physical Data modeling)- Model Development-Attributes of Modeling-ER model- the object-oriented model- record based models- physical data models- Stages of Data modeling- Modeling Three Schema Architecture- Entity Relationship [ER] model Entities Attributes and Relation [EAR] models- Entity Relationship Diagrams	

Unit V	**Transaction and Concurrency Control Techniques**	**9**
Transaction system, Testing of serializability, Serializability of schedules. deadlock handling, Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, working with oracle rdbms		
Text Books	1 Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill 2 Elmasri, Navathe, "Fundamentals Of Database Systems", Addision Wesley,5th edition	
Reference Books	1. Date C J, "An Introduction To Database System", Pearson, Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication 2. Leon & Leon, "Database Management System", Vikas Publishing House. 3. Majumdar& Bhattacharya, "Database Management System", TMH.	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studied on	09-08-2021	
Date of Approval by the Academic Council on	14-11-2021	

Course Outcome For CA 3305

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand about the database,database management system and comparison between DBMS and file oriented.	2	S
CO2	Students should be able to understand and design about RDBMS, EF Codd rules and mapping of ER diagrams.	2	Emp
CO3	Student should be able understand about database normalization and its working with SQL	2	Emp
CO4	Students should be able to understand about object modelling and database designing.	2	S
CO5	Students should be able to understand about transactions processing and various concurrency control techniques.	2	Emp

CO-PO Mapping for CA 3305

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	1	2	3	2	2	2	2	2	2	2
CO 2	3	3	2	2	3	1	3	2	2	3	2	3
CO 3	3	3	3	3	2	2	2	2	3	3	3	3
CO 4	3	3	3	3	2	2	2	3	3	2	2	3
CO 5	2	2	2	2	1	3	3	2	2	2	2	2
Avg	2.6	2.6	2.2	2.4	2.2	2.0	2.4	2.2	2.4	2.4	2.2	2.6

CA 3303	Title: Digital Logic Fundamentals	L 3	T 2	P 0	C 4
Version No.	1.0				
Course Prerequisites	Computer Fundamentals				
Objective	Understand the basic arithmetic operations are automated in computer system and use these concepts to automate more complex real life problems after studying combinational circuits				
Expected Outcome	• Students should be able to understand various Fundamental of Digital Electronics like number systems, inter conversion and binary codes etc. • Students should be able to understand the Binary arithmetic ,significance of complements of number, logic gates and NAND NOR implementation • Students should be able to understand the working of logic family and their comparison on the basis of power consumption, noise margin , fan in, fan out. • Students should be able to understand Boolean algebra Laws , solve k-Map for simplification of Boolean functions and implementation of POS and SOP simplification using logic gates. • Students should be able design various combinational circuits				

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Number System & Data Representation	10
Number System: Binary, octal, decimal & hexadecimal number system and their inter conversion. Binary Codes: BCD, Excess 3, parity, gray, ASCII & EBCDIC codes, their advantages and disadvantages. Data Representation: positive, negative, maximum and minimum number representation (related to 8 bit number) real number representation, underflow, overflow, range and accuracy of numbers.		
Unit II	Binary Arithmetic	10
Binary Addition, decimal subtraction using 9's and 10's compliment, binary subtraction using 1's and 2's compliment, multiplication and division logic gates: truth table, properties and symbolic Representation of not , NAND , or, nor ,NAND , ex-or, ex-nor gates. NOR- and NAND gates as a universal gates.		
Unit III	Boolean Algebra	10
Laws and identities of Boolean algebra Demorgan,s theorem. Use of Boolean algebra for simplification of logic expression. Karnaugh map for 2,3 4 variable, simplification of SOP AND POS logic expression using k-map		
Unit IV	Combinational circuits	9
Half adder, Full adder, parallel adder, half Subtractor, full Subtractor, 4-bit binary adder/subs tractor, multiplexor, DE multiplexer, decoder, encoder, parity detector.		
Unit V	Logic Family	9
Construction and working of TTL NAND and NOR gates. Construction and working of CMOS TTL NAND AND NOR GATES. Concept of tri -state logic, comparison of TTL AND CMOS LOGIC family with respect to propagation delay time, power consumption , noise immunity, noise margin , fan-in and fan-out		
Text Books	1. M.Morris Mano, "Digital Design "PHI, New Delhi.		

Reference Books	1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics". McGraw Hill. 2. S.K. Bose. "Digital Systems". New Age International.
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3303

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand various Fundamental of Digital Electronics like number systems, inter conversion and binary codes etc.	2	S
CO2	Students should be able to understand the Binary arithmetic ,significance of complements of number, logic gates and NAND NOR implementation	2	Emp
CO3	Students should be able to understand the working of logic family and their comparison on the basis of power consumption, noise margin , fan in, fan out.	2	Emp
CO4	Students should be able to understand Boolean algebra Laws, solve k-Map for simplification of Boolean functions and implementation of POS and SOP simplification using logic gates.	2	S
CO5	Students should be able design various combinational circuits.	2	S

CO-PO Mapping for CA 3303

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	3	1	3	2	3	2	2	3	3
CO 2	3	3	3	2	1	2	1	1	3	2	1	2
CO 3	2	3	3	2	2	2	3	2	2	3	2	2
CO 4	3	2	3	1	2	2	2	2	3	3	2	1
CO 5	3	3	3	2	2	2	3	3	3	3	3	2
Avg	2.8	2.6	2.8	2.0	1.6	2.2	2.2	2.2	2.6	2.6	2.2	2.0

CA 3304	Title: Operating System	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	**B.C.A Version 2021**
Objective	General understanding of structure of modern computers purpose, structure and functions of operating systems illustration of key OS aspects by example	
Expected Outcome	• Student should be able to understand about SystemSoftware and overview of operating systems • Student should be able to understand the concepts of Process Management functions and Deadlocks differential Calculus • Student should be able to understand the concepts of memory management Function • Student should be able to understand the concepts of I/O Management Functions • Student should be able to understand the concepts of File Management by operating system	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Introduction**	7

Functions of Operating System, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services. Multiprocessor Operating System concept, Distributed Operating Systems concept:- Introduction – Issues

Unit II	**Process Management**	7

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section, Problem, Semaphores, Classical Problems in Concurrency, Inter- Process Communication, Process Generation, Process Scheduling.

Unit III	**CPU Scheduling**	7

Scheduling Concept, Performance Criteria, Scheduling Algorithms, Multiprocessor Scheduling. Deadlocks: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from Deadlock, Distributed scheduling

Unit IV	**Memory Management**	8

Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming with Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual Memory Concept, Demand Paging, Performance, Page Replacement Algorithms, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit V	**File Management**	7

I/O Management & Disk Scheduling: I/O Devices and Organization of I/O Function, I/O Buffering, Disk I/O, Operating System Design Issues. File System: File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues. Distributed File systems concept, Distributed Shared Memory concept

Text Books	1. Silverschatz, Peterson J, "Operating System Concepts", Willey. 2. Milenekovic, "Operating System Concept", McGraw Hill.
Reference Books	1. Petersons, "Operating Systems", Addision Wesley. 2. Dietal, "An Introduction to Operating System", Addision Wesley. 3. Tannenbaum, "Operating System Design and Implementation", PHI.
Mode of Evaluation	Internal and External Examinations

Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3304

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Understand about the operating system and types of operating system.	2	S
CO2	understand the concepts of process management with various concurrency control techniques.	2	Emp
CO3	learn and implement the various CPU scheduling algo's and how dead lock occurs and how to prevent it.	3	Emp
CO4	Understand the concepts and implementation of Memory management policies and virtual memory.	2	Emp
CO5	Understand the working of file management how data is stored into memory and how it will transmit from one side to another in computer system.	2	S

CO-PO Mapping for CA 3304

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	1	2	3	1	2	2	2	2	2	2
CO 2	2	3	2	3	2	2	3	2	2	2	2	2
CO 3	3	2	1	2	3	2	1	2	2	2	2	2
CO 4	3	3	3	2	1	2	2	2	2	2	2	2
CO 5	2	3	3	2	2	3	2	3	3	3	3	3
Avg	2.6	2.6	2.0	2.2	2.2	2	2.0	2.2	2.2	2.2	2.2	2.2

CA 3340	Title: Programming in Java Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Knowledge of object-oriented paradigm in the Java programming language, .The use of Java in a variety of technologies and on different platforms.	
Expected Outcome	- Student should be able to understand the basics of Java, JDK, JVM, JRE and get to understand the OOPs concepts. - Students should be able to understand and implement the collection, framework, map, vector. - Students should be able to understand Applet, AWT and Swing Programming.	

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List of Experiments

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1. To demonstrate the general structure of java language with its various data types.
2. To accept 5 subject marks through command line arguments, find the average and total of the mark.
   Display the result in various grades as follows.
   Greater than 80 % outstanding
   60 – 80 first class
   50 – 60 second class
   40 – 50 third class
   less than 40 Fail.
3. Create one single dimensional array type of string and display the text in alphabetical order.
4. Generate a multi level inheritance program which used to demonstrate constructor overloading.
5. Generate a java program which shows the difference between static, final,, abstract access modifiers.
6. Create one object array to store minimum 50 students database.
7. Create one interface with all arithmetic operations and implement it to demonstrate Interface implementation.
8. Create one package to operate on all arithmetic operations and import those methods in normal java program.
9. To do the following operations on the given set of strings.
   a)concatenation. b) Comparison c) Character extraction. d)Length of string.
   use string buffer to generate the list of string operations.(any 7 functions)
10. Create a java program to explain multiple try and nested try block statements.
11. Create your own exception to handle the exception when the input value is more than 10.
12. Generate one single thread. a) using Thread class b) using Runnable Interface.
13. To find factorial of list of number reading input as command line argument.
14. To find prime series reading N as command line argument.
15. To sort list of elements in ascending and descending order and show the exception handling.
16. To implement constructor overloading by passing different number of parameter of different types.
17. To create student report using applet, read the input using text boxes and display the o/p using buttons.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3340

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	student should be able to write and execute basic programs of java	3	S
CO2	student should be able to write and execute program of threads	3	S
CO3	student should be able to write and execute basic program of applets	3	S

CO-PO Mapping for CA 3340

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	3	3	2	3	1	2	3	3	3	2
CO 2	2	3	2	2	2	3	2	3	3	3	3	3
CO 3	3	2	2	3	3	1	3	2	2	2	2	2
Avg	2.7	2.3	2.3	2.7	2.3	2.3	2.0	2.3	2.7	2.7	2.7	2.3

CA 3341	Title: Relational Database Management Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools. to familiarize the participant with the nuances of database environments towards an information-oriented data-processing oriented frame work, to give a good formal foundation on the relational model of data, to present SQL and procedural interfaces to SQL comprehensively	
Expected Outcome	• student should be able to write and execute DDL commands • student should be able to write and execute DML command • student should be able to write and execute DCL command	

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List of Experiments

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1. Study of DBMS, RDBMS and ORDBMS.

2. To study Data Definition language Statements.

3. To study Data Manipulation Statements.

4. Study of SELECT command with different clauses.

5. Study of SINGLE ROW functions (character, numeric,Data functions).

6. Study of GROUP functions (avg, count, max, min,Sum).

7. Study of various type of SET OPERATORS (Union, Intersect, Minus).

8. Study of various type of Integrity Constraints.

9. Study of Various type of JOINS.

10. Study of nested queries.

11. Study of various integrity constraints.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3341

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	student should be able to write and execute DDL commands	3	S
CO2	student should be able to write and execute DML command	3	S
CO3	student should be able to write and execute DCL command	3	S

CO-PO Mapping for CA 3341

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	3	2	3	3	3	3	1	3	1
CO 2	2	3	3	2	2	1	2	3	2	2	2	3
CO 3	3	2	2	3	2	2	3	2	2	3	2	2
Avg	2.7	2.3	2.3	2.7	2.0	2.0	2.7	2.7	2.3	2.0	2.3	2.0

CA 3342	**Title: Python Programming Lab**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**
Version No.	1.0				
Course Prerequisites	NIL				
Objectives	The learning objectives of this course are to understand why Python is a useful scripting language for developers to design and program Python applications and how they can implement lists, tuples, and dictionaries in Python programs. and also able to implement all basic functionalities of python.				
Expected Outcome	• Student Should be able to Write, Test and Debug Python Programs • Student Should be able to Implement Conditionals and Loops for Python Programs • Student Should be able to Lists,Tuples and Dictionaries				

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List of Experiments

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1. Python Programming Syntax and Special Data Types with Example.

2. Python Program to build calculator to perform basic operations.

3. Python Program to demonstrate slicing with all types .

4. Write a python program to implement Flow control (if-else/ ladder if else).

5. Write Python Program to show the working of different types of loops (For, while) also explain the use of arange().

6. Write a python program to check whether a number is palindrome or not.

7. Write a Python Program to demonstrate all type of List and dictionary inbuilt functions.

8. Write Python Program to print factorial of number using Function.

9. Write Python Program to show the use of function inside function and closure function.

10. Write a Python Program to design a GUI Interface using ,Entry, Label and menu.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3342

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	understand basic principles of Python programming language	2	S
CO2	Implement object-oriented concepts	2	Emp
CO3	Implement database and GUI applications.	2	Emp

CO-PO Mapping for CA 3342

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	3	2	3	3	3	3	1	3	1
CO 2	2	3	3	2	2	1	2	3	2	2	2	3
CO 3	3	2	2	3	2	2	3	2	2	3	2	2
Avg	2.7	2.3	2.3	2.7	2.0	2.0	2.7	2.7	2.3	2.0	2.3	2.0

SEMESTER 4 Year -2

CA 3401	Title: Computer Networks	L 3	T 2	P 0	C 4
Version No.	1.0				
Course Prerequisites	Nil				
Objective	The main objective of his course is to introduce the fundamental types of computer networks and to demonstrate the TCP/IP and OSI models and basic functions of individual layers of studied models.				
Expected Outcome	• Students should be able to understand the fundamental concepts of computer networking. To master the concepts of protocols, network interfaces • , and physical transmission media. • Students should be able to understand the terminology and concepts of the OSI reference model and the TCP/IP reference model. Study data link layer concepts, design issues, and protocols. • Students should be able to understand topological and routing strategies for an IP based networking infrastructure. • Students should be able to understand the transport layer services and protocols and gain knowledge about connection establishment and termination. • Students should be able to understand the use of cryptography and network security.				
Unit No.	**Unit Title**	**No. of Hrs (Per Unit)**			
Unit I	**Introduction to Computer Networks**	**10**			

Introduction of Computer Network and the types, Network Components, Elements of Data communication , Services and Protocols, Network Topologies, Transmission modes, Analog and digital signals, The OSI Reference Model and TCP/IP Model and Comparison, signal transmission, Switching Techniques- Circuit, Message switching, Packet Switching, Physical Transmission Media.

Unit II	**Layered Architecture & Data Link Layer**	**10**

Introduction to Layered Architecture and Information Flow, The OSI Reference Model and TCP/IP Model and Comparison, Data link Layer design issues, Error Detection and Error Correction Techniques, Flow Control (Sliding Window Protocol), Physical Addressing, Medium Access Techniques, Network Interfaces, ARP & RARP Protocol.

Unit III	**Network Layer & its Protocols**	**9**

Network Layer design issues, Internetworking, IPV4 & IPV6 Protocols, Logical Addressing-IP Addressing &Subnetting, Routing and Routing Protocols (RIP, OSPF, BGP), Network Address Translation (NAT), ICMP Protocol, Tunneling.

Unit IV	**Transport Layer & its Protocols**	**10**

Introduction to Transport Layer, Transport layer Services (Connection Oriented and Connectionless Services), Segmentation, port addressing , Error control (checksum) , Flow Control, Congestion Control Techniques, TCP and UDP Header, Three Way Handshaking Process(Connection Establishment and Termination), Quality of Services(QoS).

Unit V	Application Layer	9
Introduction to Application Layer and its Services, Security - Cryptography Techniques (Public Key and Private Key Cryptography) , Firewall, Compression Techniques(Lossy and Lossless Compressions), Domain Name System(DNS), Internet Architecture, Telnet, HTTP, FTP, SMTP and E-mail. Wireless connectivity(cellular, IEEE 802.16 WiMax, Bluetooth, zigbee, infrared, LTE)		

Text Books	1. Computer Networks- A Top-Down approach, BehrouzForouzan, McGraw Hill. 2. Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall.
Reference Books	1. Data Communications and Networking (4th edition), BehrouzForouzan, McGraw Hill. 2. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson.
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3401

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use , for more than One)
CO1	Students should be able to understand the fundamental concepts of computer networking. To master the concepts of protocols, network interfaces, and physical transmission media.	2	S
CO2	Students should be able to understand the terminology and concepts of the OSI reference model and the TCP/IP reference model. Study data link layer concepts, design issues, and protocols.	2	S
CO3	Students should be able to understand topological and routing strategies for an IP based networking infrastructure.	2	Emp
CO4	Students should be able to understand the transport layer services and protocols and gain knowledge about connection establishment and termination.	2	Emp
CO5	Students should be able to understand the use of cryptography and network security.	2	Emp

CO-PO Mapping for CA 3401

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	2	3	2	3	2	2	2	3	2
CO 2	3	2	2	1	2	2	3	2	2	2	2	2
CO 3	3	2	2	2	2	2	2	2	2	3	2	2
CO 4	2	3	2	2	2	3	2	3	2	2	3	2
CO 5	3	2	2	3	2	1	2	2	2	2	2	3
Avg	2.8	2.2	2.0	2.0	2.2	2.0	2.4	2.2	2.0	2.2	2.4	2.2

CA 3402	Title: Computer Organization	L	T	P	C
		3	2	0	4

Version No.	1.0
Course Prerequisites	Nil
Objective	To understand aspects of computer architecture and program performance, To provide essential understanding of different subsystems of modern computer system and design aspects these subsystems, To understand the stages in instruction life cycle
Expected Outcome	• Student should be able to understand about the fundamental organization of a computer system • Student should be able to understand about addressing modes, instruction formats and program control statements • Student should be able to understand about the architecture and functionality of central processing unit. • Student should be able to understand about the Exemplify in a better way the Input- Output organization • The student should able to understand the basics of Input Output Organization

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Computer Fundamentals & Data Representation**	**8**

Functional units of digital systems & their interconnections, Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro operation, Arithmetic Logic Shift Unit, Booth Multiplication Algorithm, IEEE standard for Floating point numbers.

Unit II	**Control Design**	**7**

Instruction types, formats, Instruction cycles & sub cycles, Fundamental Concepts (Register Transfers, performing of arithmetic or logical operations, fetching a word from memory, Storing a word in memory Hardwired Control, Micro programmed control

Unit III	**Processor Design & Pipelining**	**7**

Processor Organization: General register organization, Stack organization, Addressing mode, Data transfer &
Manipulations, Pipelining-Introduction, linear pipe-line processor

Unit IV	**Input-Output Organization**	**7**

Peripheral devices, Input-Output Interface, I/O ports, Modes Of Transfer, Types of interrupts & exceptions, Priority Interrupt, DMA, Input-Output Processor (IOP)

Unit V	**Memory Organization**	**7**

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory

Text Books	1. HAMACHER, "Computer Organization", McGraw Hill Education. 2. John P Hayes, "Computer Architecture and Organization", McGrawHill Education.
Reference Books	1. William Stallings, "Computer Organization and Architecture: Designingfor Performance", Library of Congress Cataloging-in-Publication. 2. David A Patterson and John L Hennessy,"ComputerOrganizationand Design: The Hardware/Software Interface", ARMEdition.
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3402

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student should be able to understand about the fundamental organization of a computer system	2	S
CO2	Student should be able to understand about Processor Organization Aspects	2	S
CO3	Student should be able to understand about the Instruction flow and functionality of central processing unit.	2	S
CO4	Student should be able to understand about t Input- Output organization	2	S
CO5	The student should able to understand the memory organization components	2	S

CO-PO Mapping for CA 3402

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	2	1	2	1	2	3	3	2	3
CO 2	3	2	2	1	2	2	3	3	2	3	2	2
CO 3	3	2	3	3	2	3	2	3	2	2	3	2
CO 4	3	2	3	2	2	3	3	2	3	3	2	3
CO 5	2	2	2	3	3	2	1	2	3	3	2	2
Avg	2.8	2.0	2.4	2.2	2.0	2.4	2.0	2.4	2.6	2.8	2.2	2.4

CA 3403	Title: Web Technology	L	T	P	C
		3	2	0	4

Version No.	1.0
Course Prerequisites	Nil
Objective	To introduce PHP language for server side scripting, To introduce XML and processing of XML Data with Java, To introduce Server side programming with Java Servlets and JSP,To introduce Client side scripting with JavaScript and AJAX.
Expected Outcome	• Students should be able to understand the fundamentals of PHP. • Students should be able to understand various fundamentals of XML. • Students should be able to understand and implement the concept of Servlet with JDBC concept. • Students should be able to understand various fundamentals of JSP • Students should be able to understand client side scripting concepts and its implementation.

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Introduction to PHP	11

Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

Unit II	XML	9

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

Unit III	Introduction to Servlets	10

Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

Unit IV	Introduction to JSP	9

The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

Unit V	Client side Scripting	9

Introduction to Javascript: Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation. Simple AJAX application.

Text Books	1.Web Technologies, Uttam K Roy, Oxford University Press 2.The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill
Reference Books	1.Web Programming, building internet applications, Chris Bates 2″ edition, Wiley Dreamtech 2.Java Server Pages —Hans Bergsten, SPD O'Reilly,

Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3403

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the fundamentals of PHP.	2	S
CO2	Students should be able to understand various fundamentals of XML.	2	S
CO3	Students should be able to understand and implement the concept of Servlet with JDBC concept.	3	Emp
CO4	Students should be able to understand various fundamentals of JSP.	2	Emp
CO5	Students should be able to understand client side scripting concepts and its implementation.	2	Emp

CO-PO Mapping for CA 3403

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	3	2	2	2	3	3	2	2	2
CO 2	3	2	2	3	2	3	2	2	2	2	2	2
CO 3	2	2	2	2	3	2	3	3	3	3	3	3
CO 4	2	3	3	3	2	2	2	2	3	2	2	3
CO 5	2	2	3	2	3	1	3	3	3	3	2	3
Avg	2.2	2.2	2.4	2.6	2.4	2.0	2.4	2.6	2.8	2.4	2.2	2.6

CA 3405	Title: C# .Net	L	T	P	C
		3	2	0	4
Version No.	1.0				
Course Prerequisites	CA 3101				
Objective	With the help of this course students will able to design websites, and understands the working process of social networking sites.				
Expected Outcome	• Students should be able to understand the compilation process of. net framework and web progintroduction. • Students should be able to understand all the concepts of Graphical User Interface. • Students should be able to understand the process of designing master page and all the validationcontrol. • Students should able to understand the coordinate system designing arc, rectangle etc. • Students should able to understand database connectivity and concept of frontend andbackend.				

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**C# Language Fundamentals**	**7**
Compilation Process of .Net Framework,CLR, CTS, CLSFirst C# Program, Keywords, class, Declaring and Initializing Variables, Explicitly Typed Variable, Data Types, Value Type and Reference Type, Conditional Syntax, Operator, Looping Syntax, Structure, Function, Advantage of Function, Declaration of Function and Its Syntax, Types of function		
Unit II	**Object Oriented Programming**	**7**
The first pillar: Encapsulation services, Pseudo Encapsulation: Creating read only field, The second pillar: Inheritance supports keeping family secrets: The "Protected" keyword, The Nested type definitions, The third pillar: Polymorphic support casting between types, Generating class definitions using Visual Studio. The role of .NET exceptions handling, Handling multiple exception, The finally block The last chance exception; dynamically identify application and system level exception, garbage collection optimization.		
Unit III	**Array & String**	**7**
Arrays in General, Declaring of different type Arrays, Initializing Arrays, Accessing element of different type Array Members, Arrays of Objects, Array of Structures,Using foreach with Arrays,Understanding System. String class and its various operations, encapsulation, boxing and unboxing		
Unit IV	**Graphical User Interface Concepts**	**8**
Window Forms, Event Handling: mouse and keyboard, Labels, Textboxes, Checkboxes, Radio Buttons, Picture Boxes, Month Calendar, Date Time Picker, Link Label, Grid View, ComboBox, Multithreading: Thread States, Life cycle of thread, Thread Priorities, Exception Handling.		

Unit V	Validation Controls & Implementing database with SQL Server	7

Required Field Validator, Compare Validator, Range Validator, Regular Expression Validator, Custom Validator, Master Page, Content Place Holder and Content tags, URL's in Master Pages, Authentication and authorization, Creating Table & relationship fundamentals, Insert, update, delete command in both connected & disconnected environment.

Text Books	1. "Application of .Net Technology"Tata McGraw HillEducation 2. Andrew Troelsen; Pro C# And The . Net 3. 5 Platform DreamtechPress 2. "Beginning Visual C#", Wiley India Publication.
Reference Books	1. Joel Murach; Murach's C#, Shroffmurachs
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Council on	14-11-2021

Course Outcome For CA 3405

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use , for more than One)
CO1	Students should able to explain the web designing and life cycle concepts of ASP.Net	2	S
CO2	Students should able to implements GUI applications	3	Emp
CO3	Students should be able to implement the Master Page & Validation Controls programming with C#.	3	Emp
CO4	Students should be able to understand Multimedia and Graphics application with C#.	3	Emp
CO5	Students should be able for designing and developing database with SQL Server 2008.	2	S

CO-PO Mapping for CA 3405

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	3	3	3	2	2	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	2	3	3
CO 3	3	2	2	2	3	1	2	2	2	2	3	2
CO 4	2	3	3	3	2	3	3	3	3	3	2	3
CO 5	3	3	2	3	3	2	3	2	2	3	3	2
Avg	2.6	2.8	2.6	2.8	2.6	2.2	2.8	2.6	2.6	2.6	2.8	2.6

CA 3440	**Title: Computer Network Lab**	**L T P C**
		0 0 2 1
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	Lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work	
Expected Outcome	• students should be able to Understand computer network basics, IP addressing. • students should be able to Acquire knowledge of using simulators for different connections. • students should be able to learn about framing techniques.	

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List of Experiments

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1. Study of different – 2 Network Cables and Network Interfaces.

2. Study & Implementation of IP Addressing & Sub Netting Concept.

3. Study & Implementation of Basic Network Commands and Network Configuration Commands.

4. Installation of Network Simulator (NS2).

5. Installation of Packet Tracer Tool.

6. Configure a Network Topology with Packet Tracer Tool.

7. Simulate a small Network using Network Simulator (NS2) Tool.

8. Write a program to simulate Bit-Stuffing & Char-Stuffing Data Framing Techniques.

9. Study of basic network command Network configuration commands.

10. Write a program to simulate Hamming Code (7-Bit) Error Control Technique

Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3440

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	students should be able to Understand computer network basics, IP addressing.	2	S
CO2	students should be able to Acquire knowledge of using simulators for different connections.	2	S
CO3	students should be able to learn about framing techniques.	2	S

CO-PO Mapping for CA 3440

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	3	3	2	2	2	3	3	3	3	3
CO 2	2	3	3	3	2	3	3	3	2	1	3	1
CO 3	3	2	1	3	2	1	3	2	2	3	2	3
Avg	2.7	2.3	2.3	3.0	2.0	2.0	2.7	2.7	2.3	2.3	2.7	2.3

CA 3442	Title: C# .Net Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objective	With the help of this course students will able to design websites, and understands the working process of social networking sites.	
Expected Outcome	• Students should able to learn how to implement on console application. • Students should able to learn how to implement on window application. • Students should able to learn how to design a registration page and use of validation control.	
	List of Experiments	

1. WAP to design an application using Console Application.

2. WAP to design an application using Window Application.

3. WAP to design system calculator with some scientific controls.

4. WAP to Age Calculator Using DateTimePicker (Year(s)-Month(s)-Day(s)).

5. Exercises on all basic control flow construct.

6. WAP to design registration page and apply validation control on it.

7. WAP to design an application using checkbox, month calendar, and label. When checkbox is checked month calendar is open and selected date from the calendar is display on the label.

8. WAP to add and retrieve student data using connected architecture.

9. WAP to add and retrieve student data using disconnected architecture.

10. WAP to generate mark sheets of students and display using grid view controls.

Text Books	1."Application of .Net Technology" Tata McGraw Hill Education 2. Andrew Troelsen; Pro C# And The . Net 3. 5 Platform Dreamtech Press 2. "Beginning Visual C#", Wiley India Publication.
Reference Books	1. Joel Murach; Murach's C# , Shroffmurachs
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3442

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to Learn about Graphical User Interface concept and its different controls.	2	S
CO2	Students should be able to Understand the different Validation control and master page designing.	2	S
CO3	Students should be able to Learn the database connectivity in detail and concept of array and structure.	2	S

CO-PO Mapping for CA 3442

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	3	3	3	2	2	3	3	3	3	3
CO 2	3	3	2	3	3	2	2	2	3	2	1	3
CO 3	3	2	2	1	2	3	2	2	2	1	2	2
Avg	2.7	2.3	2.3	2.3	2.7	2.3	2.0	2.3	2.7	2.0	2.0	2.7

CA 3441	**Title: Web Technology Lab**	**L T P C** **0 0 2 1**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To provide the basics of internet and various application of internet like e-mail, FTP, Telnet, Newsgroups and video conferencing	
Expected Outcome	• students should be able to learn about web technology and gain the skills. • students should be able to gain the skills and project-based experience needed for entry into web application and development careers. • students should be able to develop a dynamic webpage.	

List of Experiments		

1. Create a Web page with all type of CSS.
2. Create a Web page using HTML to embed an image map in a Web page.
3. Program using DOM & SAX parsers.
4. Creating web pages using Dream Weaver
5. Write a HTML code t o illustrate the uses of Ordered List, Unordered List, Definition List.
6. Write a XML file which will display the book information including Title of book, Author name, ISBN no., Edition, Price.
7. Write a Java Script to prompt for users name and display it on screen.
8. Design HTML form for keeping students record and validate it using Java Script.
9. Validation of user queries and responses in the Forms using Java Script or VBscript
10. Create a Homepage with frames, animation, background sound and hyperlinks
11. Develop hitometer for each client i.e. number of visitors. Visit to a site.
12. Designing simple server side program which accept some request from the client and respond

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3441

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	students should be able to learn about web technology and gain the skills.	2	S
CO2	students should be able to gain the skills and project-based experience needed for entry into web application and development careers.	3	Emp
CO3	students should be able to develop a dynamic webpage.	3	Emp

CO-PO Mapping for CA 3441

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	1	2	1	3	3	2	2	2	1	1
CO 2	3	2	3	2	3	1	2	2	3	3	3	3
CO 3	1	3	3	3	2	3	2	3	3	3	3	3
Avg	2.3	2.3	2.3	2.3	2.0	2.3	2.3	2.3	2.7	2.7	2.3	2.3

SEMESTER 5 Year -3

CA 3501	Title: PHP and MYSQL Programming	L T P C
		3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objective	By the completion of the Web Development with PHP/MySQL course you should be able to Understand the usage of PHP and MySQL in dynamic web development.	
Expected Outcome	• Students should be able to understand the concept of PHD, Decisions and Loop. • Students should be able to understand and implement the function from various perspective in PHP. • Students should be able to understand the array and its implementation in PHP. • Students should be able to understand the concept of session, cookies and HTML forms and file directories. • Students should be able to understand the database connectivity.	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Introduction to PHP, Decisions and loop	7
	Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression, Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.	
Unit II	Function	7
	What is a function, Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function.	
Unit III	Array	7
	Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function.	
Unit IV	Session, Cookies and HTML Forms, File Directories	8
	Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session, Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission, Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.	
Unit V	Database Connectivity with MySql and Exception Handling	7
	Introduction to RDBMS, Connection with MySQL Database, Performing basic database operation (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.) Understanding Exception and error, Try, catch, throw. Error tracking and debugging.	
Text Books	3. "Expert PHP and MySQL" by Andrew Curioso, Ronald Bradford	

	4. "Web Programming with PHP and MySQL" by Max Bramer
Reference Books	1. PHP and MySQL Web Development by Luke Welling, Laura Thomson 2. The Complete Reference 1st Edition
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studies on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA 3501

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concept of PHD, Decisions and Loop.	2	S
CO2	Students should be able to understand and implement the function from various perspectives in PHP.	2	Emp
CO3	Students should be able to understand the array and its implementation in PHP.	3	Emp
CO4	Students should be able to understand the concept of session, cookies and HTML forms and file directories.	2	S
CO5	Students should be able to understand and implement database connectivity with MySql and understand the concept ot exception handling.	3	Emp

CO-PO Mapping for CA 3501

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	1	1	3	2	3	2	2	2	3	1
CO 2	2	2	2	2	2	2	3	2	3	2	2	1
CO 3	2	1	2	3	2	2	2	3	3	3	2	3
CO 4	3	3	3	2	3	3	2	2	3	2	2	2
CO 5	3	2	3	3	2	2	2	2	3	3	2	3
Avg	2.6	2.0	2.2	2.2	2.4	2.2	2.4	2.2	2.8	2.4	2.2	2.0

EE 3503	Title: Mobile Technology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	It covers all the topics that are necessary to learn for repairing and servicing mobile phones.	
Expected Outcome	• Students should be able to understand the fundamentals of Basic Electronics and Mobile phone. • Students should be able to understand the hardware & materials of mobile handset. • Students should be able to repair and diagnose the general problems in Mobile Phone. • Students should be able to understand the components of audio section . • Students should be able to understand software and its applications.	

Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Introduction to Basic Electronics and Mobile Telephony**	6

Introduction to mobile phones, Generations of mobile phones, FHSS networks, Concepts of GSM , 2g , 3g , 4g LTE , WAP , GRS ,EDGE , UMTS , EVDO, Spread spectrum, CDMA, TDMA & Basic electronics components & architecture, Types of networks in cell phones, Dual Band(SIM) Handset, Tablets & Smartphone Identification of components

Unit II	**Introduction to Hardware & Materials**	

Handset Specific operating systems, Handset features & applications, working principle of mobile handset & Components used in mobile handsets. Usage of Digital Millimeter, Resistors, Capacitors and coils, Diodes & Transistors, Crystal, ICs & SMD's Identification of the different parts ,Learn to understand the parts and functioning

Unit III	**Introduction to Audio Section & Video Section**	6

Components of Audio Section Nomenclature of the Audio components• Study of Mike & Speaker, Vibrator and ringer theory, Functioning of Key pad LEDs Working Principles of Key Pad LED,Trouble shooting of the touch screen mobiles, Handsets assembly& disassembly of cell phone.

Unit IV	**Trouble Shooting &Jumpering Techniques**	8

Network problems, Power failure (dead), Mobile phone hardware troubleshooting (water damage, hanging, charging & keypad problems), Soldering & disordering &SMD rework station, Formatting / unlocking of cell phone, , Remove/replace Component & Mobile phone hardware troubleshooting (Troubleshooting through circuit diagram, transmission, transmitter filter, microphone, reception, Antenna, RF power amplifier, local oscillator, Audio IC, speaker, charger etc.)

Unit V	**Software and its applications**	4

Virus Applications, Blue Tooth Operations, Breaking of Network Locks, Downloading applications and IMEI solution with software, basics of Operating Systems and Description.

Text Books	1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 3. James Dovey and Ash Furrow, "Beginning Objective C", Apress,
Reference Books	1. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.
Mode of Evaluation	Internal and External Examinations.
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For EE3503

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to understand the fundamentals of Basic Electronics and Mobile phone.	2	S
CO2	Students should be able to understand the hardware & materials of mobile handset.	2	S
CO3	Students should be able to Repair and Diagnose the general problems in Mobile Phone.	3	S
CO4	Students should be able to understand trouble shooting and jumpering techniques.	3	S
CO5	To understand the software application in mobile phone.	2	S

CO-PO Mapping for EE3503

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	3	3	2	2	1	2	2	2	2	2
CO 2	2	2	2	2	3	2	2	2	2	2	2	2
CO 3	3	3	2	3	2	3	3	2	3	2	2	3
CO 4	2	1	2	2	2	1	2	2	3	3	3	3
CO 5	3	3	3	3	2	2	3	2	3	3	3	3
Avg	2.4	2.2	2.4	2.6	2.2	2.0	2.2	2.0	2.6	2.4	2.4	2.6

CA 3543	Title: MYSQL and PHP Programming Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	By the completion of the Web Development with PHP/MySQL course you should be able to Understand the usage of PHP and MySQL in dynamic web development.	
Expected Outcome	• Student should be able to understand of HTML, CSS & JavaScript. Also able to create website using HTML and CSS & JavaScript. • Students should be able to change content of web page using Ajax. • Students should be able to connect to database and insert data in database.	

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List of Experiments

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1. Write a program to create menu using HTML and CSS.

2. Build PHP MySQL 5 Star rating System using AJAX.

3. Write a program to sort an array of associative arrays by value of a given key in PHP.

4. Create a Sign Up form using server side form validation in PHP.

5. Exercise on to implement File System functions.

6. How create CAPTCHA in PHP contact form.

7. Write a program to upload multiple files/images in MySQL database.

8. Create CRUD Operations with MySQL in PHP.

9. Build a Login and User authentication system in PHP.

10. Write a program to manage session in PHP.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3543

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student should be able to understand of HTML, CSS & JavaScript. Also able to create website using HTML and CSS & JavaScript.	2	Emp
CO2	Students should be able to change content of web page using Ajax.	3	Emp
CO3	Students should be able to connect to database and insert data in database.	3	Emp

CO-PO Mapping for CA 3543

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	3	2	2	1	2	2	2	3	3	3	3
CO 2	2	2	3	3	3	2	3	2	2	2	3	2
CO 3	3	2	3	3	2	2	2	3	2	1	2	3
Avg	2.7	2.3	2.7	2.7	2.0	2.0	2.3	2.3	2.3	2.0	2.7	2.7

EE 3547	**Title**: **Lab on Mobile Technology**	**L T P C** **0 0 2 1**
Version No.	**1.0**	
Course Prerequisites	Nil	
Objectives	To perform practical's &understand about basic component used in mobile technology.	
Expected Outcome	• Student should be able to identify different types of mobile cell phones & their components • Students should be able to use the correct hardware tools to repair mobile cell phones • Students should be able to use the disassembling and assembling a mobile cell phone	

List of Experiments

1. To understand the Basic circuit of Mobile phone (Transmitter, Receiver and Base band control Section)

2. To study working of SIM card in GSM handset SIM card detection.

3. To Study and observe Transmitted/Received RF signal

4. Study and observe Transmitted (I & Q) /Received (I & Q) signals constellations.

5. Identification of various electronics & electrical components

6. Fabrication of mobile phone power supply using PCB & soldering

7. Study of switch faults in User Interface Section of 4G LTE Smart PhoneTechBook

8. Study and analyze the Power Management Unit in 4G LTE Smart Phone TechBook

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3547

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Student should be able to identify different types of mobile cell phones & their components	2	Emp
CO2	Students should be able to use the correct hardware tools to repair mobile cell phones	2	S
CO3	Students should be able to use the disassembling and assembling a mobile cell phone	2	S

CO-PO Mapping for CA 3547

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	1	1	2	1	2	2	3	2	3	2	2
CO 2	3	3	3	3	2	1	3	1	3	3	2	3
CO 3	3	2	3	3	3	3	2	3	1	2	3	1
Avg	2.7	2.0	2.3	2.7	2.0	2.0	2.3	2.3	2.0	2.7	2.3	2.0

CA 3544	Title: Advanced Python Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	NIL	
Objectives	The learning objectives of this course are to understand why Python is a useful scripting language for developers to design and program Python applications and how they can implement lists, tuples, and dictionaries in Python programs. and also able to implement all basic functionalities of python	
Expected Outcome	• Students should be able to understand basic principles of Python programming language • Students should be able to Implement object oriented concepts • Students should be able to Implement database and GUI applications.	

<div align="center">

List of Experiments

</div>

1. Numpy , Pandas ,and matplotlib library basic implementation.
2. Write a NumPy program to save a given array to a text file and load it.
3. Write a NumPy program to create a 3x3x3 array filled with arbitrary values
4. Write a NumPy program to convert a given array into a list and then convert it into a list again.
5. Write a NumPy program to create a 10x10 matrix, in which the elements on the borders will be equal to 1, and inside 0.
6. Write a NumPy program to compute the x and y coordinates for points on a sine curve and plot the points using matplotlib.
7. Write a Pandas program to get the powers of an array values element-wise.
   Note: First array elements raised to powers from second array
   Sample data: {'X':[78,85,96,80,86], 'Y':[84,94,89,83,86],'Z':[86,97,96,72,83]}
   Expected Output:
   X Y Z
   0 78 84 86
   1 85 94 97
   2 96 89 96
   3 80 83 72
   4 86 86 83
8. Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels. Sample Python dictionary data and list labels:
   exam data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
   'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
   'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
   'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
   labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']
9. Write a Python program to draw a line with suitable label in the x axis, y axis and a title
10. Write a Python program to draw a line using given axis values taken from a text file, with suitable label in the x axis, y axis and a title.
    Test Data:
    test.txt
    1 2
    2 4
    3 1

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA 3544

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to Write, Test and Debug Python Programs	2	S
CO2	Students should be able to Implement Conditionals and Loops for Python Programs	3	S
CO3	Students should be able to Use functions and represent Compound data using Lists, Tuples and Dictionaries	3	Emp

CO-PO Mapping for CA 3544

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	3	2	2	3	3	2	2	1	3	2	3
CO 2	3	2	3	2	2	3	2	2	3	2	2	3
CO 3	2	2	2	3	3	2	3	2	2	2	3	2
Avg	2.3	2.3	2.3	2.3	2.7	2.7	2.3	2.0	2.0	2.3	2.3	2.7

Semester 6 Year 3

CA 3601	Title: Intelligent Data Analytics	L T P C
		4 0 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objective	Intelligent Data Analytics is the science of analyzing data to convert information into useful knowledge.This knowledge could help us to understand our world better and in many context enable us to make better decision.	
Expected Outcome	• Students should be able to identify Big Data and business Implications along with different data categorization and Multidimensional Data Model. • Students should be able to understand and analyze Data Analysis Techniques with Level of Measurement & Data Management and Indexing • Students should be able to learn and demonstrate various Basic Statististical Analysis Techniques. • Students should be able to learn and analyze Data Analysis Technique using Machine Learning. • Students should be able understand reinforcement learning.	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Introduction to intelligent data analytics**	7

Defination of Intelligent Data Analytics,Size of Data,Growth of Data,Source of Data,Data in Data Analytics, Elements,variable and data categorization, NOIR Topology,Properties of Data, Nominal scale vs Binary Scale,OrdinalScale,Interval and Ration Scale, Multidimensional Data Model.

Unit II	**Data Defination and Analysis Techniques**	7

Data Management and Indexing ,Introduction to Statistical Learning and R programming, Measure of Central Tendency ,Measures the Location of Dispersions, Practice and Analysis with R.

Unit III	**Basic Analysis Technique**	7

Basic Analysis Techniques:Statistical Hypothesis Generation and Testing ,Chi-Square Test , T-Test ,Analysis of Variance,Correlation Analysis, Maximum Likelihood Test

Unit IV	**Data Analysis Technique using Machine Learning**	8

Supervised Learning with Regression & classification , Support Vector Machine, Ensemble Method, Decision Tree, Random Forest , Artificial Neural Network, clustering , Associative Rule Mining , Challenge for Intelligent Data Analytics.

Unit V	**Prescriptive Analytics**	7

Creating Data for analytics Through Designed Experiments , Creating data for Analytics through Active Learning and Reinforcement Learning ,Understanding Business Scenarios, scalable and parallel Computing with Hadoop and Map-Reduce.

Text Books	1.Probability and Statistics for Engineers and Scientist(9th edition),Ronald E.Walpole, Raymond H.Myers , Sharon L.Myers. 2.Mining Massive Data Sets, A.Rajaraman, and J.Ullman , Cambridge University Press ,2012 3.Data Mining And Analysis ,Mohammed J.Zaki, Wagner Meira, Cambridge
Reference Books	1.Hadoop:The Definitive Guide(2nd edition) By Tom White ,O'Reilly , 2014 2. Biginning R:The Statistical Programming Language ,Mark Gardener, Wiley
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3601

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to identify Big Data and business Implications along with different data categorization and Multidimensional Data Model.	2	S
CO2	Students should be able to understand and analyze Data Analysis Techniques with Level of Measurement & Data Management and Indexing	2	S
CO3	Students should be able to learn and demonstrate various Basic Statististical Analysis Techniques.	3	S
CO4	Students should be able to learn and analyze Data Analysis Technique using Machine Learning.	3	S
CO5	In this students should be able to learn about HDFS Concepts and Interfacing with HDFS & Role of Prescriptive Analytics	2	S

CO-PO Mapping for CA3601

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	2	3	2	2	3	2	2	2	2
CO 2	3	2	2	2	2	2	3	2	3	3	3	3
CO 3	2	3	3	3	2	2	3	2	2	2	3	2
CO 4	3	3	2	2	1	2	2	2	1	3	3	3
CO 5	2	3	2	2	3	2	2	2	2	2	2	2
Avg	2.4	2.6	2.2	2.2	2.2	2.0	2.4	2.2	2.0	2.4	2.6	2.4

MA 3603	Title: Mathematics	L T P C
		3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objective	To introduce the theoretical concepts of ordinary differential equations , matrix and statistics.	
Expected Outcome	• To introduce the theoretical concepts of ordinary differential equations , matrix and statistics. • Students will able the understand the concepts of differentiation and integration. • Students will able the understand the concepts of correlation and regression. • Students will able the understand the concepts of second order differential equations with constant coefficient. • Students will able the understand the concepts of time series.	

Unit No.	Unit Title	No. of hours (per Unit)
Unit I	**Matrix**	8
Elementary Operations on matrices. Inverse of a matrix. Row rank and column rank of a matrix . Rank of matrix, Eigen values, eigenvectors of a matrix. Cayley Hamilton theorem and its application .		
Unit II	**First Order Differential Equations**	6
Introduction, Solution of First order differential Equations of First degree and Higher degree.		
Unit III	**Second Order differential Equations with Constant Coefficient**	7
Introduction, Complementary Function and Particular Integral, Solution of equations		
Unit IV	**Correlation and Regression**	7
Concept of correlation, positive & negative correlation, Karl Pearson's Coefficient of correlation, meaning of regression, Two regression equations, Regression coefficients and properties		
Unit V	**Time series**	5
Introduction to time series, Objectives of time series, Identification of trend, Components of time series, Variations in time series, Methods of Trend Analysis and Choosing appropriate forecasting model.		
Text Books	1. M.D Raisinghania, Ordinary and partial differential equations, S. Chand Publication. 2. Shanti Narayan , A Text Books of Matrices. 3.Gupta, S.C., Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan publication.	
Reference Books	1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia. 2.R.K.. Jain and S R K Iyengar, Advanced Engineering Mathematics, MANarosa publication	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studied on	09-08-2021	
Date of Approval by the Academic Council on	14-11-2021	

Course Outcome For MA 3603

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To introduce the theoretical concepts of ordinary differential equations, matrix and statistics.	**2**	S
CO2	Students will able the understand the concepts of differentiation and integration.	**2**	S
CO3	Students will able the understand the concepts of correlation and regression.	**2**	S
CO4	Students will able the understand the concepts of second order differential equations with constant coefficient.	**2**	S
CO5	Students will able the understand the concepts of time series	**2**	S

CO-PO Mapping for MA 3603

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	1	2	1	2	2	1	2	2	2	2
CO 2	3	2	2	2	2	2	3	2	3	3	3	3
CO 3	2	3	3	2	2	3	3	2	2	2	3	3
CO 4	3	3	3	2	3	2	2	2	2	3	2	3
CO 5	2	2	2	2	2	2	2	3	2	2	2	2
Avg	2.4	2.4	2.2	2.0	2.0	2.2	2.4	2.0	2.2	2.4	2.4	2.6

PROGRAM ELECTIVES

CA 3503	Title: Multimedia and Animation	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the different components, different file formats and various tools of multimedia system 2. To gain knowledge in Animation and images	
Expected Outcome	After the completion of this course, the students will be able to develop applications.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Multimedia	8
What Is Multimedia: Interactive Multimedia – Advantages Of Interactive Multimedia – Where To Use Multimedia – Text – Graphics – Audio – Film – Video. UNDERSTANDING TEXT: Typeface or Fonts – Types of Fonts. COMPUTER GRAPHICS: 2D Computer Graphics – 3D Computer Graphics API. UNDERSTANDING SOUND: Basic Sound Concept – Audio Formats and Quality Levels – AIF Format – AU Format – EA Format – MIDI Format – Mp3 Format. UNDERSTANDING VIDEO: Digital Vs Analog Video	
Unit II	Photoshop	7
Opening and Importing Images – Resolution – Models and Colour Spaces – Layers. PAINTING PIXELS: The Painting Tools – Erasing – Fills – Type. SELECTION AND ALLIED OPERATIONS: Marquee selection and cropping – Lasso Selection – Paths – Combining and Transforming Selections.	
Unit III	Adjustments And Retouching	7
Tonal Adjustment – Colour Adjustments – Retouching By Hand. EFFECTS AND FILTERS: Blurring and Sharpening – Special Effects and Distortion – Layer Effects and Layer Styles	
Unit IV	Flash	7
Animation with Interacting – Basic Concepts – Drawing – Lines and Shapes – Strokes and Fill – Shapes and Brushes – Selection – Transformation and Reshaping – Importing Artwork and Manipulating Images. ANIMATION: Animating One Frame at a Time – Motion Tweening – Symbols and Instances – Shape Tweening – Sound	
Unit V	Actions	7
Buttons – Button action – Frame Action – Action and Movie Clip Symbols – Actions – Browsers and Networks – Beyond the Basic Actions. FLASH MX275: Interface Elements – Panels – Tools – Layer Folders – Accessibility – Video – 47 FSH (BCA) COMPUTER APPLICATIONS - 2015-2016 Components – User Interface Components – Changing the Appearance of Components.	
Text Books	1.Vishnu PriyaSingh , "A Text Book of Multimedia", 1st Ed., Computech Pub. Ltd, New Delhi 2.Nigel Chapman and Jenny Chapman, "Practical Multimedia", Wiley – Dream Tech Pvt. Ltd.	

Reference Books	3. Thiagharajan and Anbumani, "Flash MX 2004", Tata McGraw Hill, New Delhi. 4.Laurie Ulrich Fuller and Robert C. Fuller, "Photoshop CS3 Bible", Willey India Pvt. Ltd.
Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA3503

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	understand the characteristics of different media; understand the representations of different multimedia data; understand different data formats. Also gain understanding about Computer Graphics.	2	S
CO2	gain understanding about photo-shop fundamentals using various tools and techniques.	2	S
CO3	use various adjustments and retouching tools and techniques to produce Special Effects such as Blurring, Sharpening, Layer Effects and Layer Styles.	2	Emp
CO4	the fundamental skills to produce basic animations and motion graphics using various tools and techniques.	2	Emp
CO5	gain understanding about Flash Software and its related components to produce advance animations and graphics.	3	Emp

CO-PO Mapping for CA3503

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	2	3	2	3	2	2	2	3	2
CO 2	3	2	2	1	2	2	3	2	2	2	2	2
CO 3	3	2	2	2	2	2	2	2	2	3	2	2
CO 4	2	3	2	2	2	3	2	3	2	2	3	2
CO 5	3	2	2	3	2	1	2	2	2	2	2	3
Avg	2.8	2.2	2.0	2.0	2.2	2.0	2.4	2.2	2.0	2.2	2.4	2.2

CA 3504	Title:IT Infrastructure Management	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Today Networks and IT infrastructure components are the nerves, which enable the information flow both within and outside the organizations. Progressive enterprises have always faced challenges while managing and designing IT infrastructure, which will meet the business needs. Emerging technologies such as unified communications, enterprise wide networks, and next generation intelligent network solutions.	
Expected Outcome	Comprehensive, theory based understanding of the underpinning natural and physical and the engineering fundamentals applicable to the engineering discipline. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	
Unit No.	**Unit Title**	**No. of hours (Per Unit)**
Unit I	Introduction	7
Information Technology, Computer Hardware, Computer Software, Network and Internet, Computing Resources, IT INFRASTRUCTURE- Design Issues, Requirements, IT System Management Process, Service Management Process. Information System Design. IT Infrastructure Library		
Unit II	**Service Delivery Process**	**7**
Service Delivery Process, Service Level Management, Financial Management, Service Management, Capacity Management, Availability Management		
Unit III	**Service Support Process**	**8**
Service Support Process, Configuration Management, Incident Management, Problem Management, Change Management, Release Management, STORAGE MANAGEMENT- Backup & Storage, Archive & Retrieve, Disaster Recovery, Space Management, Database & Application Protection, Bare Machine Recovery, Data Retention.		
Unit IV	**Security Management**	**7**
Security, Computer and internet Security, Physical Security, Identity Management, Access Management. Intrusion Detection, Security Information Management		
Unit V	**IT Ethics**	**7**
Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes, EMERGING TRENDS in IT- Electronics Commerce, Electronic Data Interchange, Mobile Communication Development, Smart Card, Expert Systems.		
Text Books	1. IT Infrastructure & Its Management, Phalguni Gupta, Tata McGraw-Hill	
Reference Books	1 IT Infrastructure Management, Anita Sengar S K Kataria and Sons	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	09-08-2021	

Date of approval by the Academic Council	14-11-2021

Course Outcome For CA3504

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	IT Infrastructure Management	2	Emp
CO2	Service Delivery Process	2	S
CO3	Service Support Process	2	S
CO4	Security Management	2	Emp
CO5	IT Ethics	2	Emp

CO-PO Mapping for CA3504

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	3	1	3	2	3	2	2	3	3
CO 2	3	3	3	2	1	2	1	1	3	2	1	2
CO 3	2	3	3	2	2	2	3	2	2	3	2	2
CO 4	3	2	3	1	2	2	2	2	3	3	2	1
CO 5	3	3	3	2	2	2	3	3	3	3	3	2
Avg	2.8	2.6	2.8	2.0	1.6	2.2	2.2	2.2	2.6	2.6	2.2	2.0

CA3507	Title: Data Compression Techniques & Algorithms	L	T	P	C
		3	0	0	3

Version No.	1.0
Course Prerequisites	Nil
Objective	Gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets. illustrate the concept of various algorithms for compressing text, audio, image and video information.
Expected Outcome	• To gain a fundamental understanding of data compression methods for text, images, and video. • To understand related issues in the storage, access and use of large data sets. • To illustrate the concept of various algorithms for compressing text, audio, image and video information. • Understand the structural basis for and performance metrics for commonly used lossy compression techniques. • Understand conceptual basis for commonly used lossy compression techniques.

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Compression Techniques	8

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model,

Unit II	Compression Algorithms	6

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit III	Coding Algorithm	6

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach

Unit IV	Applications	6

File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto-front coding, CALIC, JPEG-LS, Multi-resolution Approaches

Unit V	Models	5

Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Text Books	1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers 2. Elements of Data Compression,Drozdek, Cengage Learning 3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
Reference Books	1.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer 2.Text Compression1st Edition by Timothy C. Bell Prentice Hall
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3507

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use , for more than One)
CO1	To gain a fundamental understanding of data compression methods for text, images, and video.	2	Emp
CO2	To understand related issues in the storage, access and use of large data sets.	2	Emp
CO3	To illustrate the concept of various algorithms for compressing text, audio, image and video.	2	S
CO4	Understand the structural basis for and performance metrics for commonly used lossy techniques.	2	Emp
CO5	Understand conceptual basis for commonly used lossy compression techniques.	1	S

CO-PO Mapping for CA3507

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	2	2	1	2	3	2	2	2	2	2	2	2	2	2	1	2
CO 2	3	3	2	2	3	1	3	2	2	3	2	3	3	3	2	2
CO 3	3	3	3	3	2	2	2	2	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	2	2	2	3	3	2	2	3	3	3	3	3
CO 5	2	2	2	2	1	3	3	2	2	2	2	2	2	2	2	2
Avg	2.6	2.6	2.2	2.4	2.2	2.0	2.4	2.2	2.4	2.4	2.2	2.6	2.6	2.6	2.2	2.4

CA 3505	Title: Machine Learning Concepts	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objective	To discover patterns in the user data and then make predictions based on these and intricate patterns for answering business questions and solving business problems. Machine learning helps in analysing the data as well as identifying trends.	
Expected Outcome	• Students will able the understand the concepts of machine learning • Students will able the understand the concepts various machine learning algorithm. • Students will able the understand the concepts of Bayesian learning. • Students will able the understand the concepts of instance based learning . • Students will able the understand the concepts of genetic algorithm and its uses.	
Unit No.	**Unit Title**	**No. of Hrs (Per Unit)**
Unit I	**Introduction of Machine Learning**	**8**
Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias		
Unit II	**Machine Learning Algorithm**	**7**
Decision Tree Learning - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning; Artificial Neural Networks – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of back propagation rule Back propagation Algorithm Convergence, Generalization;		
Unit III	**Evaluating Hypotheses**	**7**
Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayesclassifier, Bayesian belief networks, EM algorithm;		
Unit IV	**Computational Learning Theory**	**7**
Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning		
Unit V	**Genetic Algorithm**	**7**
An illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms- General to specific beam search-Foil		
Text Books	1.Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited 2.Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press	

Reference Books	1.Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press 2.Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
Mode of Evaluation	Internal and External Examination
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3505

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	about Machine Learning	2	S
CO2	Machine Learning Algorithm	3	Emp
CO3	Evaluating Hypotheses	2	Emp
CO4	Computational Learning Theory	2	Emp
CO5	Genetic Algorithm	3	Emp

CO-PO Mapping for CA3505

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	3	2	2	2	3	2	2	2	2	2
CO 2	2	2	2	2	3	3	3	3	3	2	2	2
CO 3	3	2	2	2	2	2	3	2	2	3	2	3
CO 4	3	3	2	3	1	2	2	2	2	3	2	3
CO 5	3	3	2	3	3	2	2	2	3	3	3	3
Avg	2.6	2.4	2.2	2.4	2.2	2.2	2.6	2.2	2.4	2.6	2.2	2.6

CA 3506	Title:Cloud Computing Foundation	L T P C
		3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objective	To provide students with the fundamentals and essentials of Cloud Computing and also a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.	
Expected Outcome	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	What the cloud is and why it's a technological and business game changer.	4
Cloud Computing, Cloud vs. Traditional architecture, Services models (IaaS, PaaS, SaaS), Google cloud architecture, The GCP (Google cloud platform) console, install and configure Cloud SDK, Google cloud shell, GCP APIs, Cloud shell code editor, Cloud console mobile app.		
Unit II	Use GCP to Build Your Apps	6
Computing services in the cloud, Exploring IaaS with Compute Engine, Configuring elastic apps with autoscaling, Exploring PaaS with App Engine, Event driven programs with cloud functions, Containerizing and orchestrating apps with Google Kubernetes Engine.		
Unit III	Structured and Unstructured Storage models	5
Storage options in the cloud, Structured and unstructured storage in the cloud, Unstructured storage using Cloud Storage, SQL managed services, Exploring Cloud SQL, Cloud Spanner as a managed service, NoSQL managed service options, Cloud Datastore, a NoSQL document store, Cloud Bigtable as a NoSQL		
Unit IV	Cloud APIs & Cloud Security	5
The purpose of APIs, Cloud Endpoints, Using Apigee Edge, Managed message services, Exploring Cloud SQL, Cloud Pub/Sub, Introduction to security in the cloud, The shared security model, Encryption options, Authentication and authorization with Cloud IAM, Identify Best Practices for Authorization using Cloud IAM.		
Unit V	Cloud networking, automation and management tools	6
Introduction to networking in the cloud, Defining a Virtual Private Cloud, Public and private IP address basics, Google's network architecture, Routes and firewall rules in the cloud, Multiple VPC networks, Building hybrid clouds using VPNs, interconnecting, and direct peering, Different options for load balancing, Introduction to Infrastructure as Code, Cloud Deployment Manager, Public and private IP address basics.		
Text Books	1. Marinescu D C, Cloud Computing Theory and Practice, Morgan Kaufmann.	

Reference Books	1. Erl T, Mahmood Z and Martinez J W, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall. 2. Stallings W, Foundations of Modern Networking, Pearson.
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3606

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	understand the use of Cloud Computing Concepts.	2	S
CO2	solve real world application development problems using Google app engine, GKE.	3	Emp
CO3	understand the need of Google cloud storage options	2	Emp
CO4	understand the use of networking and management tools.	2	Emp
CO5	machine learning applications over the cloud.	2	Emp

CO-PO Mapping for CA3606

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	3	2	2	2	3	2	2	2	2
CO 2	2	1	2	1	3	3	2	2	2	2	2	2
CO 3	2	2	2	3	2	1	2	2	2	3	3	2
CO 4	2	3	3	2	2	2	2	3	2	2	2	2
CO 5	3	3	3	2	2	2	3	2	3	3	3	3
Avg	2.2	2.2	2.4	2.2	2.2	2	2.2	2.4	2.2	2.4	2.4	2.2

CA3508	Title: IT Application Security & Privacy	L	T	P	C
		3	0	0	3
Version No.	1.0				
Course Prerequisites	Nil				
Objective	An introductory course about understanding Web Application Security, its importance and vulnerability in the industry				
Expected Outcome	• Understand modern web application development, Web Security Issues. • Be able to apply design and security principles to new problems. • Analyze and solve real world problems by exploring a web development framework as an implementation example. • Create dynamically generated web site complete with user accounts. • Create page level security, modular design using css and themes and data driven content				

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	The Owasp Project	8
Introduction to web applications security , threats and OWASP principles , introduction to secure design, typical attack models (MITM, MITB) and other attacks (DOS, ARP cache poisoning, DNS cache poisoning etc.)		
Unit II	Internet E-Mail	8
Architecture and infrastructure, functions, agents and standards , MIME and PGP , phishing, spamming and spoofing, DKIM, SPF, Introduction to email forensics		
Unit III	Browser	8
general concepts, functionalities, browsers war, browsers comparison ,configuration (cookies, contents, scripting, etc.) ,Attack to browsers and users tracking/profiling (third party cookies, supercookies, cookie theft etc.) Browser security (add-ons, same-origin policy etc.) and secure browsing		
Unit IV	Web Server	6
Introduction to a secure set-up of Apache ,Firewalling a web server		
Unit V	Privacy Preserving	6
Attacks to privacy (spyware and backdoors, browser, email etc.) ,Identity theft ,Advanced browser configuration ,Anonymity		

Text Books	1. Web Application Security, A Beginner's Guide 1st Edition, by Bryan Sullivan, Vincent Liu (Author) 2. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, by Dafydd Stuttard, Marcus Pinto (Author)
Reference Books	1. Mastering Modern Web Penetration Testing , Prakhar Prasad (Author)
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3508

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Understand modern web application development, Web Security Issues	2	Emp
CO2	Apply design and security principles to new problems.	2	Emp
CO3	Analyze and solve real world problems by exploring a web development framework as an implementation example	2	S
CO4	Create dynamically generated web site complete with user accounts	2	Emp
CO5	Create page level security, modular design using css and themes and data driven content	1	Emp

CO-PO Mapping for CA3508

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	2	3	3	3	2	3	2	2	2
CO 2	2	3	3	3	1	2	3	3	2	2	2	2
CO 3	3	3	3	3	2	2	3	2	3	3	1	3
CO 4	3	2	2	2	3	3	2	3	3	2	3	3
CO 5	3	3	3	3	2	2	3	2	2	3	3	3
Avg	2.6	2.6	2.6	2.6	2.2	2.4	2.8	2.4	2.6	2.4	2.2	2.6

CS 3602	Title: E-Commerce	L T P C
		3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To develop an understanding of scope of E-Commerce. To develops an understanding of electronic market and market place. To develop an understanding of business models.	
Expected Outcome	Students would be able to analyze the concept of electronic market and market place. Students would be able to understand the business models. Students would be able to understand the business standards	

Unit No.	Unit Title	No. of hours (per Unit)
Unit 1	Overview of Electronic Commerce	7
Main Activities of E-Commerce, Broad Goals of E-Commerce, E-Commerce technical Components, Functions of E-Commerce, Prospectus of Ecommerce, Lessons from E-commerce Evolution, Scope of E-commerce.		
Unit II	E- Commerce Strategies	7
E-commerce Technical Architecture, E-commerce Essentials, Ecommerce applications, Foundation of E-commerce, Growth of E-Commerce, Advantages of E-Commerce, Disadvantages of E-commerce, progress of E-commerce in India.		
Unit III	Reference Models	7
Driving the E-commerce Revolution. E-commerce Activities, Matrix of E-commerce models, B2C, B2B, B2B Boom, E-commerce opportunity Frame work, Developing an E-commerce Strategy, International E-commerce, and International Strategy Development, Dotcom Companies.		
Unit IV	Electronic Market	7
Online Shopping, Online Purchasing, Electronic Market, Three models of Electronic Market, Markets category, International Marketing, one-to –one Marketing, Permission Marketing, pull and push technologies, B2B Hubs, B2B market places, B2B exchange.		
Unit V	Electronic Business	8
Electronic Business applications Emerging applications, Electronic Business Architecture, AMR Model for Electronic Business, Evolution of Electronic Business, Application, Dotcom companies, The Indian scenario for E-Business, electronic business implementations, B2B E-commerce, B2C E-commerce, B2B Market Place.		
Text Books	1. E-Commerce Concepts. Models, Strategies C.S.V Murthy, Himalaya Publishing House 2. The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business by Janice Reynolds	
Reference Books	1.E-Commerce: Fundamentals and Applications by Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang	
Mode of Evaluation	Internal and External Examinations	

Recommendation by Board of Studies on	09-08-2021
Date of approval by the Academic Council	14-11-2021

Course Outcome For CA3602

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	understand about Electronic Commerce	2	S
CO2	understand about Electronic Commerce strategies	2	S
CO3	understand about Reference Models	2	Emp
CO4	understand about Electronic Market	2	Emp
CO5	understand about Electronic Business	2	Emp

CO-PO Mapping for CA3602

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	1	1	2	3	2	2	2	2	2	3
CO 2	2	1	2	1	3	2	1	3	2	1	3	1
CO 3	2	2	2	2	1	3	3	2	2	2	2	2
CO 4	3	3	3	2	2	2	2	2	3	3	2	3
CO 5	3	3	3	3	3	2	3	2	3	3	2	3
Avg	2.4	2.2	2.2	1.8	2.2	2.4	2.2	2.2	2.4	2.2	2.2	2.4

CA3603	Title: Cryptography and Network Security	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objective	To know the methods of conventional encryption. To understand the concepts of public key encryption and number theory. To know about Techniques for ciphering.	
Expected Outcome	• Students should be able to learn about the Cryptography & Network security, along with different IT/cyber laws to combat cyber crime • Students should be able to understand and analyze how different cryptographic algorithms and hashing techniques secure data and ensure CIA triad of network security • Students should be able to understand about various forms of malicious virus threats over internet. • Students should be able to learn about firewalls and other intrusion detection techniques. • Students should be able to learn about techniques of web secuirty.	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	Overview	8

Information Security, Security Objectives, OSI Security Architecture, Introduction to Cryptography: Symmetric and Asymmetric Cryptography, Steganography, Symmetric Encryption Model, Introduction to Group, Conventional Encryption Techniques: Substitution ciphers and Transposition ciphers. Stream Ciphers and Block Ciphers, Prime and Relative Prime Numbers.

Unit II	Block Ciphers & Public Key Cryptography	7

Product Ciphers, Modern Block Ciphers - Components, Shannon's theory of Confusion and Diffusion, Fiestal Structure, Data Encryption Standard (DES): Working, Round Functions and Key Generation, Key distribution, Principles of public key crypto systems: Private key and Public key, RSA algorithm, Key Management, Diffie-Hellman Key Exchange Algorithm.

Unit III	Hash Functions and Digital Signatures	7

Message Authentication and Hash Function: Authentication Requirements, Authentication Functions, Message Authentication Code (MAC), Message Digest Code (MDC), Hash Functions, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA). Digital Signatures: Digital Signature Standards (DSS).

Unit IV	Network & System Security	7

Key Exchange, Key Distribution, Authentication Applications: Kerberos Operation, Kerberos Servers, X.509 Certificates, Electronic Mail Security- Pretty Good \Privacy (PGP), S/MIME, TCP/IP, HTTP. System Security: Intruders – Intrusion Detection System (IDS), Viruses and Related Threats, Firewall – Types of Firewall.

Unit V	IP & Web Security	7

IP Security: Architecture, Authentication header, Encapsulating security payloads (ESP), Key Management – Internet Key Exchange. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

Text Books	1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson Education 2. Behrouz A. Ferouzan, "Cryptography and Network Security", Tata McGraw-Hill,
Reference Books	1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3603

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to learn about the Cryptography & Network security, along with different IT/cyber laws to combat cyber crime	2	**Emp**
CO2	Students should be able to understand and analyze how different cryptographic algorithms and hashing techniques secure data and ensure CIA triad of network security	2	**Emp**
CO3	Students should be able to understand about various forms of malicious virus threats over internet.	2	**S**
CO4	Students should be able to learn about firewalls and other intrusion detection techniques.	2	**Emp**
CO5	Students should be able to learn about Basics, setting of VPN configuration and concepts of exchanging keys, modifying security policy.	2	**Emp**

CO-PO Mapping for CA3603

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	2	2	2	2	2	1	2	3	3	3	2
CO 2	3	3	3	2	3	2	2	3	1	2	2	2
CO 3	2	2	2	3	2	3	3	1	2	3	3	2
CO 4	2	3	2	2	2	3	3	2	2	1	2	3
CO 5	3	2	2	3	2	2	3	3	3	2	3	2
Avg	2.4	2.4	2.2	2.4	2.2	2.4	2.4	2.2	2.2	2.2	2.6	2.2

CA3606	Title: Digital Image Processing & Analysis	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	None	
Objective	To study the image fundamentals and mathematical transforms necessary for image processing. To study the image enhancement techniques. To study image restoration procedures. To study the image compression procedures.	
Expected Outcome	- Review the fundamental concepts of a digital image processing system. - Analyze images in the frequency domain using various transforms. - Evaluate the techniques for image enhancement and image restoration. - Categorize various compression techniques. CO5: Interpret Image compression standards. - Interpret image segmentation and representation techniques.	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Introduction and Fundamentals**	8
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise- Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.		
Unit II	**Image Enhancement in Frequency Domain**	7
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters –Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters; Homomorphic Filtering.Image Restoration: A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Red		
Unit III	**Color Image Processing**	7
Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components.		
Unit IV	**Registration & Segmentation**	7
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging –Algorithms to Establish Correspondence, Algorithms to Recover Depth Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following.		
Unit V	**Feature Extraction**	7
Representation, Topological Attributes, Geometric Attributes, Description: Boundary-based Description, Region-based Description, Relationship. Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching		
Text Books	1. Rafael C. Gonzalvez and Richard E. Woods, Digital Image Processing 2nd Edition,.; PHI. 2. B. Chanda, D.D. Majumder, "Digital Image Processing & Analysis", PHI	
Reference Books	1. R.J. Schalkoff; Digital Image Processing and Computer Vision, John Wiley and Sons, NY 2. A.K. Jain; Fundamentals of Digital Image Processing, Prentice Hall, Upper Saddle River, NJ.	
Mode of Evaluation	Internal and External Examinations	

Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3606

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students would be able to develop Mathematical background required for Machine learning architecture algorithmic/ Programming based on real life application using text and speech	2	Emp
CO2	Students would be able to develop the syntax and architecture of word and sentence architecture with its basic copra of Natural Language	2	Emp..
CO3	Students would be able to develop model and parsing the text for language modeling and limitations of these models also explored	2	S
CO4	Students would be able to apply applications of advanced NLP with Deep learning and machine learning framework are developed.	2	Ent
CO5	Students would be able to Find out the future direction and limitation of AI	1	S

CO-PO Mapping for CA3606

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	2	3	2	2	3	1	2	2	3	2	3	2
CO 2	3	2	3	2	1	3	2	3	2	3	2	2
CO 3	2	2	3	3	2	2	2	2	2	2	2	2
CO 4	2	3	2	2	3	3	2	3	3	2	3	2
CO 5	2	2	1	3	2	2	2	2	2	3	2	3
Avg	2.2	2.4	2.2	2.4	2.2	2.2	2	2.4	2.4	2.4	2.4	2.2

CA 3604	Title: Introduction to Cyber Laws & Crime	L	T	P	C
		3	0	0	3
Version No.	1.0				
Course Prerequisites	Nil				
Objective	To recognize the developing trends in Cyber law and the legislation impacting cyberspace in the current situation. To generate better awareness to battle the latest kinds of cybercrimes impacting all investors in the digital and mobile network. To recognize the areas for stakeholders of digital and mobile network where Cyber law needs to be further evolved.				
Expected Outcome	Make Learner Conversant With the Social and Intellectual, Property Issues Emerging From 'Cyberspace. Explore the Legal And Policy Developments In Various Countries To Regulate Cyberspace. Make Study On Various Case Studies On Real Time Crimes.				

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Introduction to Computer security**	**8**
Definition, Threats to security, Government requirements,Need of cyber Law, Information Protection and Access Controls,Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, Cyber Jurisprudence at International and Indian Level.		
Unit II	**Cyber Law**	7
International Perspectives UN & International Telecommunication Union (ITU) Initiatives Council of Europe - Budapest Convention on Cybercrime, Asia- Pacific Economic Cooperation (APEC) , Organization for Economic Co-operation and Development (OECD) , World Bank,Commonwealth of Nations.		
Unit III	**Cyber Crime**	7
Internet, Hacking, Cracking, Viruses, Virus Attacks, Pornography, Software Piracy, Intellectual property, Legal System of Information Technology, Social Engineering, Mail Bombs, Bug Exploits, and Cyber Security		
Unit IV	**Investigating Cybercrime**	7
Investigating Cybercrime: Digital Evidence and Computer Forensics, Interception, Search and Seizure, and Surveillance Information Warfare, Cyber terrorism, and Hacktivism, Terrorism, Radicalization, and The War of Ideas, Trade Secret Theft and Economic Espionage, National Security		
Unit V	**Organizational and Human Security**	7
Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.		
Text Books	1. Debby Russell and Sr. G.T Gangemi, "Computer SecurityBasicsn (Paperback)", 2nd Edition, O' Reilly Media. 2. Thomas R. Peltier, "Information Security policies and procedures:A Practitioner's Reference", 2nd Edition PrenticeHall.	

Reference Books	1. Kenneth J. Knapp, "Cyber Security and Global InformationAssurance: Threat Analysis and Response Solutions", IGI Global. 2. Jonathan Rosenoer, "Cyber law: the Law of theInternet", Springerverlag.
Mode of Evaluation	Internal and External Examination
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3604

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	understand about Computer security	2	S
CO2	understand about Cyber Law	2	Emp
CO3	understand about Cyber Crime	2	Emp
CO4	understand about Investigating Cybercrime	2	Emp
CO5	understand about Organizational and Human Security	2	S

CO-PO Mapping for CA3604

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	2	2	2	2	3	3	1	3	3	2
CO 2	1	2	3	2	3	2	2	1	3	2	2	2
CO 3	2	2	2	3	2	3	3	3	2	1	3	2
CO 4	2	3	2	2	2	3	2	3	3	3	3	3
CO 5	3	2	3	3	2	2	2	2	3	2	2	2
Avg	2.2	2.2	2.4	2.4	2.2	2.4	2.4	2.4	2.4	2.2	2.6	2.2

| CA3605 | Title: Introduction to Mobile Application Development. | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

Version No.	1.0
Course Prerequisites	Nil
Objective	To understand the basic principles of Mobile application development. To develop mobile applications.
Expected Outcome	• Students should be able to understand about to mobile application principles. • Students should be able to understand concepts of mobile programming language and practices. • Students should be able to understand about to recognize the areas for stakeholders of digital and mobile network. • Students should be able to understand concepts of mobile app testing environment. • Students should be able to understand concepts of mobile services.

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Mobile Application Principles**	8

Mobile Application Development Paradigm - What is an application? Mobile Application - Programming rules and Challenges - Mobile Programming Tools - Mobile Application Evolution - Thin Client - Fat Client - Future of Mobile App Development - Mobile Client Server App Architecture - Introduction to Client-Server Architecture - Distributed Client-Server Architecture - Role of Client-Server - Adaptation Techniques - Extended Client-Server Architecture - Mobile Data

| Unit II | **Mobile Programming Language And Practices** | 7 |

Mobile App Programming in Java - Introduction to Java - Java Compiler - Java Interpreter - Advantages of Java - Disadvantages of Java - Programming Methodology - Mobile App Programming in C++ - Introduction to C++ - Symbian C++ - Microsoft embedded VC++ - Mobile Programming best practices - User Analysis - Organizational Analysis.

| Unit III | **Mobile Platform and Mobile Services** | 7 |

Mobile Applications: What is Web App? - Context of Mobile Applications - Pros and Cons of Mobile Web App Evolution of Mobile Services - Types of Mobile Services - Personal Services – CommModuley Services - Introduction to Consumer Services - Various Consumer Services , Overview and Features of Mobile Services.

| Unit IV | **Interlocution to Android Mobile Application** | 7 |

Introduction to Android- Android- Background & Architecture, Setting up development environment- configuring Android Studio, Dalvik Virtual Machine & .apk file,Emulator-Android Virtual Device- Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Application Fundamentals:Basic Building blocks - Activities,Services,Broadcast Receivers & Content providers

| Unit V | **Developing Android Application** | 7 |

Application Structure- AndroidManifest.xml, uses-permission & uses-sdk, Resources & R.java, Layouts & Drawable ResourcesActivities and Activity lifecycleFirst sample Application, UI Components -, Form widget, Text Fields, Layouts, Time and Date, Images and media, AlertDialogs & Toast, Conceps of Intents- Explicit Intents,Implicit intents, Android Menus- Option menu, Context menuSub menu, menu from xml, menu via code

Text Books	1. Jeff McWherter, Scott Gowell , "Professional Mobile Application Development".
Reference Books	1. Reza, Mobile Computing Principles: "Designing and Developing Mobile Applications". 2. Murphy Mark, L. "The Busy Coder's Guide to Advanced Android Development"
Mode of Evaluation	Internal and External Examinations
Recommended by Board of Studied on	09-08-2021
Date of Approval by the Academic Council on	14-11-2021

Course Outcome For CA3605

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	Students should be able to learn how to design and develop mobile apps for iphone, ipad and ipod as well as mobile devices types.	2	S
CO2	Students should be able to learn about basic knowledge of mobile application development in C# language and modern mobile operating systems	2	Emp
CO3	Students should be able to understand about data transmission standards	2	Emp
CO4	Students should be able to learn about systems for mobile application distribution	2	Emp
CO5	Students should be able to learn about mobile application development	3	Emp

CO-PO Mapping for CA3605

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	3	3	2	3	2	3	2	3	2	2	3
CO 2	3	3	3	3	2	3	2	2	2	3	2	1
CO 3	3	3	2	3	2	2	3	3	3	3	2	2
CO 4	2	2	3	2	2	3	3	2	3	2	3	2
CO 5	3	2	3	3	1	1	3	2	3	3	2	3
Avg	2.8	2.6	2.8	2.6	2	2.2	2.8	2.2	2.8	2.6	2.2	2.2

CA3607	Title: Introduction to Computer Vision	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	None	
Objective	To introduce students the fundamentals of image formation; To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; To develop an appreciation for various issues in the design of computer vision and object recognition systems; and To provide the student with programming experience from implementing computer vision and object recognition applications.	
Expected Outcome	• identify basic concepts, terminology, theories, models and methods in the field of computer vision, • describe known principles of human visual system, • describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition, • suggest a design of a computer vision system for a specific problem	

Unit No.	Unit Title	No. of Hrs (Per Unit)
Unit I	**Image Formation Models**	8
Monocular imaging system, Orthographic& Perspective Projection, Camera model and Camera calibration, Binocular imaging systems		
Unit II	**Image Processing and Feature Extraction**	7
:Image representations (continuous and discrete), Edge detection		
Unit III	**Motion Estimation**	7
Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion		
Unit IV	**Shape Representation and Segmentation**	7
Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis		
Unit V	**Object recognition**	7
Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition		
Text Books	1. Ballard D., Brown C., Computer Vision, Prentice Hall	
Reference Books	1.Sonka M., Hlavac V., Boyle R., Image Processing Analysis and Machine Design. PWS Publishers	
Mode of Evaluation	Internal and External Examinations	
Recommended by Board of Studied on	09-08-2021	
Date of Approval by the Academic Council on	14-11-2021	

Course Outcome For CA3607

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (*Use , for more than One*)
CO1	To introduce students the fundamentals of image formation; To introduce students the major ideas, methods,	2	Emp
CO2	To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition;	2	Emp
CO3	To develop an appreciation for various issues in the design of computer vision and object recognition systems;	2	Emp
CO4	To provide the student with programming experience from implementing computer vision and object recognition applications.	2	Emp
CO5	The Students should be able to build image processing applications	2	Emp

CO-PO Mapping for CA3607

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO 1	3	2	1	2	3	3	3	2	2	2	2	2
CO 2	2	3	2	3	2	2	2	2	2	2	2	2
CO 3	3	2	1	2	3	2	1	2	2	2	2	2
CO 4	3	3	3	2	1	2	2	2	2	2	2	2
CO 5	2	3	3	2	2	3	2	3	3	3	3	3
Avg	2.6	2.6	2	2.2	2.2	2.4	2.0	2.2	2.2	2.2	2.2	2.2