Department of Computer Science and Information Technology (CSIT)
Guru Ghasidas Vishwavidyalaya, Bilaspur

www.ggu.ac.in

(A Central University established by the Central Universities Act, 2009)

Chhattisgarh- 495009

STUDENTS' HANDBOOK
&
ACADEMIC PROGRAMMES
By
Department of C S I T

Important Notice

The students are informed to see University website www.ggu.ac.in for latest updates on admissions, examinations, notices and other information. This handbook may be used as a basic source of information/ help at this time and should not / cannot be used as the source to claim any information. Please contact University Website / department / University in case of any clarification on any information.

Professor Alok Kumar Chakrawal

Vice-Chancellor
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.) 495 009 India
Phone : 07752-260283
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Message from the Vice Chancellor

I feel immense pleasure and a sense of responsibility on being appointed as the Vice-Chancellor of this temple of learning named after the great saint, Baba Guru Ghasidasji, who descended on the pious land of Chhattisgarh. Guru Ghasidas Central University is the Central University of Chhattisgarh which bears the important charge of providing job-oriented education, taking care of the educational aspirations, dissemination of quality education and enlightenment of the people of local society and remote areas. We shall make efforts in a comprehensive manner to grow this University, named after the great saint Baba Guru Ghasidasji, like a banyan tree of higher learning at national and international level.

I communicate, at the start of the new academic session, my best wishes to all the teachers, officers, employees, research scholars, and students of the university. There are prospects, opportunities, and aims available for us, by pursuing which we will stand at par with the leading universities of the country. Infrastructure development along with improvement in academic quality, and development of new dimensions of research and innovation are the foremost in our priorities.

Smooth implementation of various ambitious plans of Government of India such as ‘Ek Bharat, Shrestha Bharat’, ‘Unnat Bharat Abhiyan’, National Service Scheme (NSS), National Cadet Corps (NCC), and ‘Swachata Abhiyan’ will be ensured. A new milestone will be established in the area of interdisciplinary research with 3 MV high-current pelletron accelerator project.

A University is a place of global learning across all disciplines. Our Prime Minister, Shri Narendra Modi Ji, declared ‘National Education Policy-2020’ on 29th July, 2020, keeping in mind the holistic approach of education from the pre-primary to the post-graduate and research level. It is my firm opinion that ‘National Education Policy-2020’ will be a game changer for

India at national and international level, leading to all kinds of social, economic, political and strategic growth. The entire nation is dedicated to implementing 'NEP-2020' in a complete manner. Our Prime Minister has addressed the nation and informed about the regress of the implementation of NEP-2020 on its anniversary day, 29th July 2021, for its effective follow-up.

I look forward to an unconditional support and cooperation from all stakeholders to enhance the quality and standard of higher education at Guru Ghasidas Vishwavidyalaya, Bilaspur. I am sure that our honest and combined efforts for the progress of Guru Ghasidas Vishwavidyalaya will certainly result in setting a new benchmark in the field of higher education.

I request philanthropist, industrialist, alumni and pillars of the society to donate profusely to Guru Ghasidas Vishwavidyalaya for the cause of betterment of higher education and of the student perusing their studies on the campus. I welcome innovative ideas for the growth of the students of Guru Ghasidas Vishwavidyalaya and of the society in a holistic manner. The region surrounding Bilaspur in Chhattisgarh state is in dire need of good industries and financial institutions. I will appreciate industries for helping with their cooperation in creating a strong industry-institution interaction with the University. The underlying idea of the said efforts is to ensure that well-rounded graduates come out of Guru Ghasidas Vishwavidyalaya.

I am open to all good and innovative suggestions for the betterment of Guru Ghasidas Vishwavidyalaya and its students. I look forward once again to the institutions of higher education and learning, research institutes, industries, FICCI, ASSOCHAM, local Chamber of Commerce, professional bodies, Municipal Corporation of Bilaspur, Local and State Administration and all stakeholders for their kind cooperation in the growth and development of Guru Ghasidas Vishwavidyalaya.

(**Professor Alok Kumar Chakrawal**)

Vice Chancellor
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.) 495 009 India

HOD’s Messages

It is my pleasure and honour to welcome you to the Department of Computer Science and Information Technology. The goal of our department is to provide a multitude of challenging career opportunities to the students to serve industry, academia and social needs. Our department strongly encourages innovative ideas, creativity, research and new advancement in the computer field. The department provides a platform to the students for productive careers through an excellent teaching-learning environment. The department has highly qualified, well experienced, dedicated and motivated faculty members. Our faculty members aim to deliver high-quality education to the students to explore their technical knowledge and skills. I am sure that the students of our department will excel in their academic achievements in their respective job areas. I wish all the students a great academic career.

This brochure provides information on academic, teaching, rules and regulations related to MCA, M.SC (CS) ,B.Sc(CS), BCA, PhD. programmes of the CSIT department.

(**Prof. A.K. Saxena**)

Head of the department
Computer Science & Information Technology

My Details

Student Photo

Name: ----------

Father's Name: ----------

Mother's Name: ----------

Blood Group: ----------

Address: ----------

Phone: ----------

Mobile: ----------

Whom to Call

in case of Emergency: ----------

Phone number 1: ---------- **Phone number 2:**----------

e-mail: ----------

Local Guardian's Name: ----------

(If any)

Driving License Number: ----------

Other Information: ----------

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ABOUT THE UNIVERSITY

Guru Ghasidas Vishwavidyalaya, a Central University established by an Act 2009 of the Parliament, was established initially as State University by an Act of State Legislative Assembly of the then undivided Madhya Pradesh on 16 June 1983.GGV is an active member of the Association of Indian Universities and Association of Commonwealth Universities. The National Assessment and Accreditation Council (NAAC) has accredited the University as B+.

Situated in a socially and economically challenged area, the Vishwavidhyalaya is appropriately named to honour the great Satnami Saint Guru Ghasidas (born in the 17th century), who championed the cause of the downtrodden and waged a relentless struggle against all forms of social evils and injustice prevailing in the society.

The Vishwavidyalaya is a residential institution. The Vishwavidyalaya covers almost the total spectrum of higher education in Vishwavidyalaya teaching departments and, offering various courses in the areas of Arts, Commerce, Education, Engineering and Technology, Humanities, Life Sciences, Management, Pharmacy, Sciences and Social Sciences.

The lush green sprawling campus of the Vishwavidhyalaya spread over an area of approx. Six hundred fifty-five acres is located five KM away from the main Bilaspur Town. River Arpa, the lifeline of Bilaspur, runs parallel to the Vishwavidhyalaya campus. Bilaspur is a fast Industrializing City, already having a large number of industrial units coming up in the region. The area is the nerve centre of trade in iron and steel, coal, aluminium, textiles, foodgrains, ' Kosa' silk, cement, paper, furniture and jewellery and is internationally known for its rice production.

The Vishwavidyalaya aims at disseminating and advancing knowledge by providing instructional and research facilities in various branches of learning. It promotes innovation in the teaching-learning process, interdisciplinary studies & research, establish linkages with the industries for the promotion of science & technology, educate and train man-power for the development of the country and is committed to the improvement of the social and economic conditions & welfare of the people by improving their intellectual, academic & cultural development.

The city is well connected with all parts of the country by road and rail. Being a railway zone, Bilaspur facilitates travel by train to and from any part of the country. 120 Kilometers away, at Raipur, the capital of Chhattisgarh, is the nearest airport.

History

Guru Ghasidas University (GGU) was established by an Act of the State Legislative Assembly in 1983 as Guru Ghasidas Vishwavidyalaya. The university is suitably named to honour the great Satnami Saint Guru Ghasidas, who championed the cause of the downtrodden and waged a constant effort against all forms of social evils and injustice existing in the society. Guru

Ghasidas Vishwavidyalaya was given the status of a Central University under Central University Ordinance 2009, No. 3 of 2009.

Department at a Glance

The Department of Computer Science & Information technology (CSIT) started in the year 1990 with a one-year PG Diploma course (PGDCA). This course was followed by a Master's degree course in Computer Science as well as Information Technology (M.Sc.(CS) and M.Sc.(IT)) in 1996. Subsequently, Master of Computer Application (MCA) course, approved by the All India Council of Technical Education (AICTE), New Delhi, was introduced in the year 1998. The department has a large number of branded PCs with the latest configuration. Every student can have enough time for hands-on practice on these machines. CSIT has its own departmental library besides the Central Library. The department has an Internet facility in the Computer Center, which is used as a lab of CSIT in the same building.

The department has well-qualified faculty members having live interaction & collaboration with Other National & International Universities & Institutions. The faculty members of the department are actively involved in R&D activities. The faculty members publish their research articles in National and International Journals and proceedings. The faculty members have been invited to deliver invited talks in India and abroad. Expert lectures are conducted in the department from time to time. The students are motivated to develop real-time projects and assigned a software development live project, preferably in reputed organizations Seminars, and Group Discussions are the regular features of the department. Department has organized a number of National Seminars on emerging issues in Computer Science like Data Mining & E-Governance. These seminars proved to be a great success. The seminar brought a good gathering of researchers, academicians not only from Chhattisgarh but all over the country. Eminent speakers delivered their expert talks on the issues during the seminar. On 16-17 March 2011, CSIT organized an international conference on Soft Computing and ICT (SCICT-2011) eminent speakers prof C.T.Lin (Taiwan), Prof Sun Wang Cho (Korea), Prof Jun Wang (Singapur), Prof A.K.Pujari (VC Sambalpur University, India), Prof G. Panda (IIT Bhubaneswar, India) and Prof N.S.Choudhary (IIT, Indore, India) have delivered their expert lecture during the conference. This conference was attended by 300 delegates, including students, faculty members, researchers from all over the country. The proceeding of the conference was also published. The department encourages student-teacher interaction. Students are given the freedom to consult teachers at any time in the department for their problems or suggestions. The department has always been buzzing with activities. The department is planning to establish International research collaborations. The Department of CSIT revises its course curriculum frequently, looking at the need of the industries to place our students there and has a closed interaction with software and R&D organizations. The passing out students have an excellent placement record and are able to secure jobs around the globe in reputed companies. On 24 March 2012, CSIT organized a one day workshop on the "National e-governance plan (NeGP)" awareness campaign supported by the Department of Information Technology, Govt. of India.

The Vision

Creating, transmitting and applying knowledge to improve the social, cultural and economic quality of life of people in Chhattisgarh and India. Guru Ghasidas Vishwavidyalaya aims at a collaborative, intellectual, multicultural community distinguished by partnerships with existing institutions, both public and private, cooperative agreements, which enable students, faculty, and staff to cross institutional boundaries for innovative inputs, broadly defined scholarly and creative activities and coordinated community services.

The CSIT Programme

1. The Master of Computer Application (MCA) - Two-Year Full-Time programme.
2. The Master of Science in (M.Sc. CS) - Two Year Science Full-Time programme.
3. Bachelor of Science in Computer Science - Three-Year Full-Time programme.
4. Bachelor of Computer Applications - Three-Year Full-Time programme.
5. Doctorate (Ph.D.) in Computer Science

Objectives of the program

The program prepares students to obtain positions as system analysts, systems designers, Programmers and managers in any field related to information technology. The program, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice. The MCA, M.Sc(CS) and B.Sc(CS) students are encouraged to spend a full semester working in the industry in the institute, giving them insight into the workings of the IT world. However, the course curriculum will have enough flexibility to enable a student to undertake advanced studies in computer science later on.

Academic Programmes

Courses Available

Courses Offered	Seats	Duration	Eligibility for admission
B.Sc. (Comp.Sc.)	75	3 Year (6 Sem.)	Minimum 50% aggregate at 10+2 level with Maths from any recognized Board or equivalent Max. age limit: 22 years
B. C. A. (Under Self-financing scheme)	60	3 Year (6 Sem.)	Minimum 50% aggregate at 10+2 level from any recognized Board or equivalent Max. age limit: 22 years
M.Sc (Comp.Sc.)	35	2 Year (4 Sem.)	B.Sc. (Computer Science/ Information Technology as main subject in all 3 years) under 10+2+3 pattern/BCA, securing a minimum of 50% marks in aggregate or equivalent. Max. age limit: 25 years
M.C.A.	75	2 Year (4 Sem.)	Minimum 50 % marks in aggregate or equivalent at graduation with Mathematics as one of the subjects at 10+2 level or at graduation from recognized university/institution. Max. age limit: 25 years
Ph.D	-	-	As per rules.

Fee Structure

Course	At the time of admission Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI
B.Sc. (Comp.Sc.)	5350	2800	3550	2800	3550	3100
B.C.A.	36950	30400	31150	30400	31150	30700
M.Sc. (Comp.Sc.)	12200	9650	10400	9950	-	-
M.C.A.	14700	12150	12900	12150	-	-

Faculty Members

Name	Prof. A. K. Saxena
Designation	Professor
E-Mail-ID	amit.saxena65@ggu.ac.in
Contact No.	94252-22744
Teaching & Research Experience	32 Years
Specialization	Soft Computing, Data Mining

Name	Dr. Ratnesh Prasad Shrivastava
Designation	Associate Professor
E-Mail-ID	ratnesh.csit@ggu.ac.in
Contact No.	63978-43727
Teaching & Research Experience	17 Years
Specialization	Data Science, Computer Vision, Block Chain, Programming Languages, Formal Verification

Name	Dr. Girish Kumar Singh
Designation	Associate Professor
E-Mail-ID	gkrsingh@gmail.com
Contact No.	94799-83851
Teaching & Research Experience	11 Years
Specialization	Machine Learning, Cyber Security, Cryptography. Mathematical Computing

Name	Dr. Shrabanti Mandal
Designation	Associate Professor
E-Mail-ID	shrabanti.mandal@ggu.ac.in
Contact No.	70064-35642
Teaching & Research Experience	10 Years
Specialization	Data Mining, Fuzzy Logic, Machine Leaning, Optimization Techniques , IoT

Name	Dr.Pushplata Pujari
Designation	Assistant Professor
E-Mail-ID	pujari.lata@rediffmail.com
Contact No.	94252-62192
Teaching & Research Experience	17 Years

Specialization	Soft Computing,Data Mining

Name	Dr. Rajwant Singh Rao
Designation	Assistant Professor
E-Mail-ID	rajwantrao@gmail.com
Contact No.	88275-72070
Teaching & Research Experience	12 Years
Specialization	Compiler Design, Theory of Computation, Artificial Intelligence

Name	Amitesh Kumar Jha
Designation	Assistant Professor
E-Mail-ID	amitesh2911@yahoo.co.in
Contact No.	98279-30291
Teaching & Research Experience	17 Years
Specialization	Data Mining

Name	Dr. Sushma Jaiswal
Designation	Assistant Professor
E-Mail-ID	Jaiswal1302@gmail.com
Contact No.	99937-81013
Teaching & Research Experience	17 Years
Specialization	Digital Image Processing

Name	Dr.BabitaManjhi
Designation	Assistant Professor
E-Mail-ID	babita.majhi@gmail.com
Contact No.	90987-15203
Teaching & Research Experience	13 Years
Specialization	Machine Learning, Deep Learning, Data Mining, Time Series Analysis, Adaptive Signal Processing

Name	Dr. Akhilesh Kumar Shrivas
Designation	Assistant Professor
E-Mail-ID	akhilesh.mca29@gmail.com
Contact No.	93406-19416, 90981-74759
Teaching & Research Experience	3 Years

Specialization

Name	Dr. Amit Kumar Chandanan
Designation	Assistant Professor
E-Mail-ID	chandanan.amit@gmail.com
Contact No.	94251-51309
Teaching & Research Experience	18 Years
Specialization	Soft Computing,Data Mining

Name	Abhishek Patel
Designation	Assistant Professor
E-Mail-ID	patel.abhishek@ggu.ac.in
Contact No.	95842-96307
Teaching & Research Experience	3 Years
Specialization	Machine Learning

Name	Prashant Vaishnav
Designation	Assistant Professor
E-Mail-ID	prashanth.vaishnav@gmail.com
Contact No.	91319-22305
Teaching & Research Experience	3 Years
Specialization	

Name	Dr. Vikas Kumar Pandey
Designation	Assistant Professor
E-Mail-ID	vikaspandeymmyvv@gmail.com
Contact No.	93033-38726
Teaching & Research Experience	3 Years
Specialization	

Name	Vivek Kumar Sarathe
Designation	Assistant Professor
E-Mail-ID	v_sarathe@hotmail.com
Contact No.	77730-50900
Teaching & Research Experience	3 Years
Specialization	Soft Computing,Data Mining

Technical Staff

Name	Dr. Ghazala Mumtaz Mollick
Designation	System Programmer
E-Mail-ID	ghazalamumtaz@gmail.com
Contact No.	94076-01928
Working Experience	33 Years
Specialization	Computer Architecture

Name	Mrs. AmitaToppo
Designation	System Programmer
E-Mail-ID	lakraamita@gmail.com
Contact No.	76979-21644
Working Experience	19 Years
Specialization	--

Staff Members

Computer Science & Information Tech. & Computer Centre 07752-260356	Mr. Ajay Kumar Tiwari	9827917544
	Mr. R. K.Tomar	
	Mrs. Keshar Sharma	
	Mr. Vishal Nath Jaiswal	

Code of Conduct for Students

The students are admitted to Guru GhasidasVishwavidalaya to achieve excellence and shape their character to become responsible citizens. They must realize their responsibility towards the Vishwavidalaya and to its components like faculty, staff and fellow students. Failure to maintain a good standard of conduct shall result in disciplinary action.

Attendance:

75% attendance is compulsory in each subject.

MISCONDUCT

Any of the following activities (but not limited to these only) will be termed as misconduct:

1. Disruption of teaching activities or disturbing the learning process of other students in the campus.
2. Any act on the part of the students, which disrupts the functioning of the University, endangers health & safety of campus residents & damages the University properties.
3. Cheating in the examination & supplying false documents /information in order to seek any consideration/favour from the University.
4. Possession or consumption of intoxicating beverages on the campus.
5. Failure to return back the loaned material, settle University dues.
6. Possession of weapons.
7. Use of un-parliamentary language while in conversation with university staff & fellow students.

Disciplinary Actions:

Failure to adhere to good conduct may result in disciplinary actions like:

1. A warning by the authorities.
2. Suspension from the particular class.
3. Suspension/Expulsion from the university.
4. Suspension of campus privileges e.g. hostel, accommodation, etc.
5. Withholding of examination results or withdrawal of awarded diploma/degree certificate.
6. Any other disciplinary action deemed appropriate by the university authorities.

RAGGING

It is observed that a perverse form of ragging is prevalent in institutions of higher learning.

The Government and the apex courts of the country have taken a very serious view to combat the menace of ragging in universities and other educational institutions. Ragging has been recognized as the "Cognizable offence" and is punishable under law. The following could be the possible punishments for those who are found guilty of participation in or abetment of ragging. The quantum of punishment shall, naturally, depend upon the nature and gravity of the offence as established by the disciplinary committee or the court of law.

Punishments:

1. Cancellation of admission.
2. Suspension from attending the classes.
3. Withholding/withdrawing scholarships/fellowships & other benefits.
4. Debarring from appearing in any tests / examination or other evaluation process; withholding results.
5. Debarring from representing the institution in any national meet, tournament, youth festival, etc.
6. Suspension / Expulsion from the hostel.
7. Rustication from the institution for period varying from 1 to 4 semesters.
8. Expulsion from the institution & consequent debarring from admission to any other institution.
9. Fine up to Rs. 25000/-
10. Rigorous imprisonment up to three years.

While the first ten types of punishment can be awarded by the appropriate authority of the institution itself, the last punishment can be awarded by a court of law.

Awards & Scholarships

The topper of each batch is awarded a Gold Medal and Merit Certificate in the convocation of the University.

Facility in the Campus

Hostel: Hostel facilities for boys and girls are available on the campus.

Computer Centre: The University has a sophisticated computer centre equipped with the latest versions of hardware and software. The centre has appropriate statistical, scientific and simulation packages to cater to educational and managerial needs. The Centre has installed one VSNL based leased line with 64 Kbps capacity. Students of the Department are eligible to avail the centralized computer facility. The department has a fully air-conditioned computer lab with WiFi facilities well connected with LAN networking and necessary software for management students.

Library: The University has a well-stocked, up-to-date library containing about 86.000 books, 1650 back volumes of journals and five thousand projects / PhD thesis. Presently, it subscribes to about 150 Indian and foreign journals in various disciplines. The reprographic facility at a subsidized rate is provided to the users along with other library services. The library has an internet facility, and library automation with INFLIBNET link is under progress. Besides the central library, students can also use the departmental library.

National Service Scheme: The University has a unit of National Service Scheme (NSS), having a total strength of 100 students from the University Teaching Departments. The aim of NSS is to provide an opportunity and working experience for social services. The students participate in various activities like plantation, blood donation, seminar, essay writing, quiz, debate etc...

Post Office and Bank: The residents and students on the Campus are provided with Banking & Communication facilities. Punjab National Bank, Extension Counter (PNB) and Post Office are rendering their services on the Campus. ATM (24 hours) facilities, as well as online banking, have been recently introduced by the PNB. Also, ATM (24 hours) facilities by the State Bank Of India is available on the Campus. A new electronic telephone exchange is also established on the Campus.

Health Centre: Health and ambulance facilities to the students and residents are available in the health Centre located near the University Computer Centre. One Medical officer with other staff is posted to take care of the centre.

SC/ST Cell: University has a separate SC/ST cell. The cell processes and provides assistance to the SC/ST students to get scholarships as per the Government rules and deals with all the problems of the SC/ST students.

Conference Hall: The Department has a fully air-conditioned state of the art conference hall

with a seating capacity of 120 participants. The Hall is well equipped with modern audiovisual gadgets, including facilities for power-point presentations.

Cultural Activities: University, as well as each department, conducts cultural activities every year.

Campus Development: Students and faculty of the department are actively involved in developing the area surrounding the department.

Canteen Facility: Vishwavidyalaya has a canteen on the Campus, near the administrative building. The canteen provides snacks, tea, coffee, cold drink, etc. during office hours as well as working lunch. It operates from 10 am to 5 pm. on all working days. The canteen committee appointed by the Vishwavidyalaya monitors the quality, rates and standards.

Auditorium: One State of art auditorium with a seating capacity of about 800 audiences has recently been constructed near the administrative block.

Post Office and Bank: Punjab National Bank, Extension Counter and Post Office Koni are rendering their services on the Campus. ATM facilities by the State Bank of India & PNB are available on the Campus. A new electronic telephone exchange is also established on the Campus.

Staff Quarters: There are staff quarters for the Teaching and Non-teaching staff of the University. The staff colony is very well connected by roads with well-lit avenues. The colony is surrounded by lush green trees with a pleasant environment.

Vishwavidyalaya Guest House: Vishwavidyalaya Guest House has 16 well-furnished suites, including 8 VIP/ AC suits that provide a comfortable stay for the visitors to the Campus. Additional Guest House facility for 64 persons is also available in the Forestry Guest House. The Guest Houses also provides lodging and boarding to visitors as well as during seminars/conferences etc., on reasonable charges.

INDUSTRY-ACADEMIA INTERACTION

The Department strives to establish a strong relationship with the industry through invited talks, meetings, and training programmes for the students. Industrialists are also invited to participate in the admission process of the students.

Central Placement Cell

Department has a placement cell that organizes industrial visits, summer placements and campus recruitment.

ACADEMIC ACTIVITIES

Guest Lectures

In order to strengthen academic inputs and to minimize the gap between theory and practice, regular teaching is supplemented by guest lectures by eminent academicians, industrialists and through seminars and conferences.

Activities, Seminar, Workshop & Lecture Series

Apart from guest lectures, the Department has taken steps to boost the academic activities by organizing lecture series, conferences, workshops, and training programmes for corporate executives. Following conferences, seminars, workshops & training programmes were organized by the Department in the past.

1. National Conference on Cyber Security, Data Mining and ICT for The Society on 18-19 January 2006.
2. National Seminar on Data Mining & E-Governance on 17 February, 2007.
3. Workshop on PC Maintenance and Networking on 07th Feb-10th Feb, 2010.
4. International Conference on Emerging Trends in Soft Computing and ICT, from 16-17 March, 2011.
5. Workshop on "National e-governance plan (NeGP)" awareness campaign supported by Department of Information Technology, Govt. of India ,24, March, 2012.
6. Workshop on "Web site Designing and Development ", 2012, in three batches for the students of this university.
7. Workshop on "Basics of Networking Tools and Concepts", 2016 March for the students of CSIT.
8. Prof A K Saxena, collaborated with University UTAR, Malaysia and it is in effect.
9. SERB and CGCOST sponsored National conference organized on Data analytics, machine learning and Security, 15-16 Feb. 2018
10. Prof. L. A. Zadeh Memorial online Lecture Series, organized on 20-28 Oct. 2021.
11. One week Online FDP on Emerging Trends of Machine learning and applications, 7-11, March 2022.
12. SERB and CGCOST sponsored National conference on Machine learning, deep learning and IOT, organized on 19-20 January 2023

Apart from this, a number of invited lectures are conducted in the CSIT department from time to time.

SCHEME OF EXAMINATION FOR MCA AND M.SC(CS)

Maximum Marks 100

(The University Examination Rules, Schemes will be applicable time to time, visit website)

Internal Assessment (30 Marks)

- In each semester the university conducts two unit test examinations for each theory subject carrying 30 marks, out of which the scoring of best one is selected.
- Maximum 5 marks are allotted to Assignment works / presentation.
- Maximum 5 marks are allotted to each theory subject basing on the attendance percentage.

Distribution of Internal Assessment marks out of 30 in each subject for all courses

SUMMATIVE ASSESSMENT	FORMATIVE ASSESSMENT	COMMULATIVE MARKS	TOTAL
[15] Marks	[15] Marks	[30] Marks	[30] Marks

End Semester Exam (70 Marks)

At the end of each semester, the final Semester exam is conducted for each theory subject carrying 70 Marks and practical subjects carrying 100 marks each.

Note: Final Marks for MCA / M.Sc. (CS) / B.Sc. (CS)/B.C.A.

- Sum of internal assessment and end semester exam marks is considered as final mark scored in each subject.
- The minimum passing mark for theory subjects is 40% of the total marks and 50% of the total marks for practical subjects.

ATTANDANCE

I. Attendance of a student should not be less than 75 % in a semester failing of which he/she will not be allowed to appear in the end semester examination.

II. Maximum 15 % relaxation in attendance will be given based on medical certificate / NSS / Sports / Other University related activities for students having attendance in the range 60 to 75%. This relaxation applies only to students lying within attendance range of 60 to 75% to allow them to appear in the end semester examination.

III. Students of the above category II must produce valid certificates issued from the competent authority. Strict action will be taken against students presenting fake certificates including fake medical certificates etc.

SYLLABUS M.C.A

(The scheme and syllabi of any programme can be modified from time to time, students are advised to refer to University website for updates if any/ consult their respective teachers)

Department of Computer Science & Information Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
SYLLABUS FOR MCA 2 YEAR DEGREE COURSE

Semester 1

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	CAPATT1	Operating System	4		30	70	4
2	CAPATT2	Artificial Intelligence	4		30	70	4
3	CAPATT3	Relational Data Base Management Systems	4		30	70	4
4	CAPATD1/ D2/D3	Elective I	4		30	70	4
5	CAPATD4/ D5/D6	Elective II	4		30	70	4
6	CAPALT3	RDBMS LAB		2		100	2
7	CAPALD1/ D2/D3/D4 /D5/D6	LAB based on Elective –I / II		2		100	2
		Total	20	04	150	550	24

Semester 2

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	CAPBTT1	Design and Analysis of Algorithm	4		30	70	4
2	CAPBTT2	Software Engineering			30	70	4
3	CAPBTT3	Optimization Techniques	4		30	70	4
4	CAPBTD1/ D2/D3	Elective III	4		30	70	4
5	CAPBTD4/ D5/D6	Elective IV	4		30	70	4
6	CAPBLD1/ D2/D3/D4 /D5/D6	LAB based on III / IV		2		100	2
7	CAPBPF1	Minor Project		2		100	2
		Total	20	04	150	550	24

Semester 3

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	CAPCTT1	Machine Learning	4		30	70	4
2	CAPCTT2	Computer Graphics and Multimedia	4		30	70	4
3	CAPCTT3	Data Mining and Data Warehousing	4		30	70	4
4	CAPCTD1/ D2/D3	Elective V	4		30	70	4
5	CAPCTD4/ D5/D6	Elective VI	4		30	70	4
6	CAPCLD1/ D2/D3/D4 D/5D/6	Lab based on V / VI		2		100	2
7	CAPCPF1	Minor Project		2		100	2
		Total	20	04	150	550	24

Semester 4

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	CAPDPF1	Major Project	-	-	-	500	22
		Total	-	-	-	500	22

Electives

Sl.No	Paper Code	(1)	(2)	(3)
1	CAPATD1/D2/D3	Advanced JAVA Programming	Probability and Statistics	Linux Operating System and Shell Programming
2	CAPATD4/D5/D6	Computer Network	Mobile Application Programming	V.B.Net Programming
3	CAPBTD1/D2/D3	E-Commerce	Cloud Computing	Neural networks and Deep Learning
4	CAPBTD4/D5/D6	Web Technology	Image Processing	Pattern Recognition
5	CAPCTD1/D2/D3	Big Data Analytics	Advanced Operating System	Data Science using Python
6	CAPCTD4/D5/D6	Compiler Design	Network Security	Parallel processing

Bridge Course: (Non Credit Course to be completed within maximum allowable duration for completing MCA course).

List of subjects:

1)Fundamentals of Computer Science

2)C programming

Total Course Credits-100

Note: electives to be decided at the start of the respective semester.

*** The syllabus is subjected to change as per the requirement.**

CAPATT1

Operating System

1.Introduction: Definition, Design Goals, Types, Batch processing, Multi-programming, Real time, Timesharing; Functions of Operating System.

2.Process Management: Process states, Process Control block, Schedulers, CPU Scheduling algorithms

3. **Inter process synchronization and communication:** need, Mutual exclusion, semaphore, classical problems in concurrent programming, critical region and conditional critical region, Deadlock Characteristics, prevention, resource allocation graphs.

4. **Memory Management**: Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing,

5.File and Secondary Storage Management: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management.

UNIX/ LINUX/ WINDOWS/Android as an example of Operating systems

Readings:

1.Operating System Concepts 6/ed By Silber Schatz and Galvin, Addison Wesley.
2.Operating Systems: Internals and Design Principles 5/ed By William Stalling, PHI.
3.Modern operating Systems By Tanenbaum, PHI.
4.Operating System Concepts By Peterson and Silber Schatz, Addison Wesley.
5.Operating System Principles By P. B. Hansen, PHI.
6.The UNIX Operating System By K. Christian, John Wiley.

CAPATT2

Artificial Intelligence

1.Introduction: Definitions and approaches, Foundation of A.I., Challenges in AI, Area and Applications of A.I., Intelligent Agents: meaning, types, environments, examples.

2. Problem Solving: Problem solving as state space search, production system, writing production system and solution for a Water jug problem; some AI classical problems (statements only) cannibal missionaries, tower of Hanoi, tic tac toe, 8-puzzle, Search techniques: Breadth First, and Depth-first, Best-First Search, Hill-climbing, Heuristics, A* algorithm, local and global maxima(minima),

3. Knowledge Representation and Reasoning: Predicate and prepositional logic, conversion of sentences towffs of predicate logic, Resolution, clause form, Skolem functions, Unification, Resolution in Propositional and predicate logic, Semantic Nets.

4. Pattern Recognition: Meaning of pattern, Pattern Recognition, Classification, Supervised &Unsupervised Learning of classifiers, K-NN, K-MEANS algorithms.

5. Expert Systems: Introduction, Advantages, components and participants in an expert systemApplication

Readings:

1.Artificial Intelligence: E. Rich and K. Knight, Tata McGraw Hill.

2.Artificial Intelligence: A New Synthesis by Nilsson, Morgan Kaufmann.

3.Pattern Classification 2nd Edition By R.O. Duda, Hart, Stork (2001) ,Johnwiley, New York.

4.Pattern Recognition: Technique and Applications By Shinghal (2006) ,Oxford University Press,New Delhi.

CAPATT3

Relational Data Base Management System

1.Overview of Database Management :Data, Information and knowledge, Increasing use of data as acorporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases.

2.Relational Model: Entity - Relationship model as a tool for conceptual design-entities attributes and relationships. ER diagrams; Concept of keys: candidate key, primary key, alternate key, foreign key; Strong and weak entities, Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features.

3. Structured Query Language : Relational Algebra: select, project, cross product different types of joins(inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages, Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.

4.Relational Database Design: Normalization concept in logical model; Pitfalls in databasedesign, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of indexes, File organization for relational tables, De-normalization.

5.Introduction to Query Processing and Protecting the Database & Data Organizations : Parsing,translation, optimization, evaluation and overview of Query Processing. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Triggers, Security & Authorization in SQL.

Readings:

1.Database system concept By H. Korth and A. Silberschatz, TMH.

2.Data Base Management System byAlexies&Mathews, Vikas publication.

3.Data Base Management System by C. J. Date, Narosha Pub.

4.Data Base Management System by James Matin.

5.Principles of Database System by Ullman.

6.An Introduction to database systems By Bipin Desai, 2011 ed., Galgotia Publication.

7.Database Management System by A. K. Majumdar &P. Bhattacharya, TMH

CAPATD1

ELECTIVE-I (1)

Advanced Java Programming

1. **Basics of Core JAVA:** class, interface, exception handling.
   Collections: Collection Interfaces, Concrete Collections, The Collections Framework.
   Multithreading: Creating thread and running it, Multiple Thread acting on single object, Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread.

2. **Networking:** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP ClientSockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams.
   Java Database Connectivity (JDBC): Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC,Prepared Statements, Transaction Processing, Stored Procedures.

3.**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle,HandlingHTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession

4.**Java Server Pages (JSP):** Introduction, JavaServer Pages Overview, A First JavaServerPageExample, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries, **EnterpriseJava Bean:** Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties,Typesofbeans, Stateful Session bean, Stateless Session bean, Entity bean

5. **Remote Method Invocation:** Defining the Remote Interface, Implementing the Remote Interface,Compiling and Executing the Server and the Client, **Struts:** Basics of Struts,Struts : What and Why?,Model1 vs Model2 ,Struts2 Features, Steps to create Struts application ,Understanding Action class ,Understanding struts.xml file

Readings:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" by Antonio Goncalves– Apress publication

CAPATD2

ELECTIVE-I(2)

Probability and Statistics

1.**Descriptive measures** : Frequency distribution, mean, median, mode, standard deviation, moments,skewness and kurtosis, **Probability:** Definitions of Probability, Addition Theorem, ConditionalProbability, Multiplication Theorem, Bayes‟ Theorem of Probability.

2.**Random Variables and their Properties:** Discrete Random Variable, Continuous Random Variable,Probability Distribution, Joint Probability Distributions Their Properties, Transformation Variables, Mathematical Expectations, Covariance.

3.**Probability Distributions:** Discrete Distributions: Binomial, Poisson Negative Binominal Distributionsand their Properties; Continuous Distributions : Uniform, Normal, Exponential Distributions and their Properties.

4.**Multivariate Analysis and Curve Fitting**: Correlation, Correlation Coefficient, Rank Correlation,Linear Regression, Multiple Regression, Principles of Least Squares and Curve Fitting

5.**Estimation and testing of hypothesis**: Sample, Populations, Statistic, Parameter, SamplingDistribution, Standard Error, Un-Biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation. Small Sample Tests. Large Sample Tests.

Readings:

1. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2002
2. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.

3.Probability, Statistics and Random Processes, T.Veerarajan Tata McGraw – Hill
4.Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

CAPATD3

ELECTIVE-I (3)

Linux operating System and Shell Programming

1. **INTRODUCTION TO LINUX:** History, The Linux Architecture, Features of Linux, Internal andExternal Commands, Command Structure, difference between Linux and Unix, various Linux distributions, basic commands.**UTILITIES:** file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text processing utilities and backup utilities, Security commands. The vieditor, security by file Permissions.
2. **INTRODUCTION TO SHELLS:** Session, Standard Streams, Redirection, Pipes, Tee Command,Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Edition Environment Customization. Filters.

GREP: Operation, grep Family, Searching for File Content.

SED: Scripts, Operation, Addresses, commands, Applications.

AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications.

3. **INTERACTIVE KORN SHELL:** Korn Shell Features, Two Special Files, Variables, Output, Input,Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

KORN SHELL PROGRAMMING: Basic Script concepts, Expressions, Decisions Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

4. **INTERACTIVE C SHELL:** C shell features, Two Special Files, Variables, Output, Input, Exit Statusof a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts. **C SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions: Making Selections,

Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

5. **FILE MANAGEMENT:** File Structures, System Calls for File Management–create, open, close, read,write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

Readings:

1.Sumitabha Das, "Unix Concepts and Applications", 4thEdition. TMH, 2006. (1, 2 units)

2.Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1stEdition,Cengage Learning India, 2003.

3.Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.

4.Graham Glass, King Ables, "Unix for programmers and users", 3rd Edition, Pearson Education, 2009.

5. N.B Venkateswarlu, "Advanced Unix programming", 2ndEdition, BS Publications, 2010.

6.YashwanthKanitkar," Unix Shell programming", 1stEdition, BPB Publisher, 2010.

7.Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill

CAPATD4

ELECTIVE-II (1)

Computer Networks

1.Introduction and Physical Layer: Introduction: Goal and application Network Hardware andSoftware, Protocol Hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Model ,Types of computer Network :LAN,MAN,WAN, Topologies, Transmission mode.

Physical Layer :Data and signal, Analog and digital Communication, Transmission Media,Conceptofdata transmission, Switching Techniques, Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM.

2. **Data Link Layer:**Data Link Layer design issues Data link control: Framing, Flow control. ErrorDetection and Correction. DLC protocol: Stop and Wait Protocol, Sliding window protocol, A Simplex protocol for noisy channel, Medium access sublayer: Channel allocation :static and dynamic ,Multiple access protocol FDDI, Data Link Layer in the Internet : SLIP,PPP. Wired and Wireless LAN protocol.

3. Network Layer: The Network Layer Design Issue, IP addressing, Address mapping, Error reporting ,Multicasting ,Delivery, Forwarding and Routing. The Network Layer in the Internet : The IP Protocol. Subnets, Internet control protocols, internet multicasting.

4. Transport Layer : The Transport layer services, concept of client and server in terms of socket addressing Quality of service,, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP.

5.Presentation and Application Layer : Network Security, Traditional Cryptography, Private key cryptography and public key cryptography, Authentication protocols, DNS ,SNMP,E-mail, application layer protocols.

Readings:

1. Data Communications and Networking By Forouzan, Tata McGraw Hill Company.

2.Computer Networks By A.S. Tanenbaum

3.Computer Network By S.S.Shinde ,New Age International Publisher.

4.Data and computer Communication by Shashi banzal, Firewall media

5.Internetworking with TCP/IP: Principles,protocols,and Architecture Vol 1 5th Edition ,PHIpublication

6.Data Communications and Computer Network by Prakash C Gupta, PHI Publication.

CAPATD5

ELECTIVE-II (2)

Mobile Application Programming

1.Introduction of Mobile Application: Fundamentals of mobile applications, mobileApplicationenvironment and mobile operating Systems, IDEs and various Tools.

2.**Introduction of Mobility and Building blocks of Mobile Application.**: Mobile Applicationdevelopment Activity life cycle, Mobile Landscape, Mobile Platforms, overview of various Mobile application tools.

3.Mobile Operating Systems: Android library and its characteristic, iOS library and its characteristic,Windows Phone 7 library and its characteristic

4.App functionality based User interface and Mobile functions: Application user Interface designing,User Interface Element, Menu, interaction among the activities. Threads, Asynchronous task, Service – states and life cycles, Notifications, Broadcast receivers, Telephony and SMS API, Animation API multimedia –Audio/Video playback and record, location aware etc.

5.Mobile Application development in Android: Android Architecture -Android Stack–Linux Kernel,Android Runtime Environment Dalvik virtual Machine, Android Emulator. Basics Application creation and deployment in Android, Introduction of mobile application database SQLite.

Readings:

1.Professional Mobile Application Development, Jeff Mcwherter, Scott Gowell, WroxPublisher, 1st Ed. 2012

2.Sams Teach Yourself Android Application Development in 24 Hrs, Lauren Darcy and Shane Conder, 1sted.

3. Android Programming, Bill Philips and Brain Hardy.

4. Android Recipes: A problem-Solution Approach ,Dave Smith and Jeff friesen.

CAPATD6

ELECTIVE-II (3)

VB.NET Programming

1. **.Net framework and VB.Net:** Evolution of the .NET Framework–Overview of the .NetFramework – VB.NET – Simple VB.Net Program. VARIABLES, CONSTANTS AND EXPRESSIONS: Value Types and Reference Types – Variable Declarations and Initializations – Value Data Types – Reference Data Types – Boxing and Unboxing – Arithmetic Operators – Textbox Control – Label Control – Button Control.

2.Control Statements: If Statements–Radio Button Control–Check Box Control–Group BoxControl – List box Control – Checked List Box Control – Combo box Control – Select Case Statement – While Statement – Do Statement – For Statement. METHODS AND ARRAYS: Types of Methods – One Dimensional Array – Multi Dimensional Arrays – Jagged Arrays. CLASSES: Definition And Usage of a Class – Constructor Overloading – Copy Constructor – Instance and Shared Class Members – Shared Constructors.

3.Inheritance and Polymorphism: Virtual Methods–Abstract Class and Abstract Methods–Sealed Classes. INTERFACES, NAMESPACES AND COMPONENTS: Definition of Interfaces– Multiple Implementations of Interfaces – Interface Inheritance – Namespaces – Components – Access Modifiers. DELEGATES, EVENTS AND ATTRIBUTES: Delegates – Events – Attributes – Reflection.

4.Exception Handling: Default Exception Handling Mechanism–User DefinedExceptionHandling Mechanism – Throw Statement – Custom Exception. MULTITHREADING: Usage Of Threads – Thread Class – Start(), Abort(), Join(), and Sleep() Methods – Suspend() And Resume() Methods – Thread Priority – Synchronization. I/O STREAMS: Binary Data Files – Text Files - Data Files – FileInfo and DirectoryInfo Classes.

5.Additional Controls: Timer–ProgressBar–LinkLabel–Panel–TreeView–Splitter–Menu–SDI & MDI – Dialog Boxes – Toolbar – StatusBar. DATABASECONNECTIVITY: Advantages Of ADO.NET – Managed Data Providers – Developing a Simple ADO.NET Based Application Creation of Data Table – Retrieving Data From Tables – Table Updating – Disconnected Data Access Through Dataset Objects.

Readings:

1. Muthu C. (2008), ”Visual Basic.NET”, 2nd Ed., Vijay Nicole Imprints Pvt.Ltd.,.
2. Jeffrey R.Shaprio (2002), “Visual Basic .NET The Complete Reference”, Mac Graw Hill
3. Michael Halvorson (2010), “Visual Basic 2010 Step by Step”, Microsoft Press.
4. Harold Davis (2002), “Visual Basic.NET Programming”, Sybex.

CAPBTT1

Analysis & Design of Algorithm

1.Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, AsymptoticNotation-Big oh notation, Omega notation, Theta notation and Little oh and omega notation, recurrence relation: Substitution method, Master method.

Deterministic Algorithms

2.Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort.

Greedy method: General method, Greedy knapsack problem, Minimum cost spanning trees: prim's andkruskal‟s algorithm, Single source shortest path problem: Dijkstra's Shortest Path Algorithm, Huffman coding.

3.Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binarysearch trees, , Longest Common Sub sequence Problem. **Back Tracking**: 8-quen problem, GraphColoring, Hamiltonian Cycle, **Branch and Bound:** 0/1knapsack problem, travelling sales person problem

Non-Deterministic Algorithms

4.Interactable problems: Basic concepts,non-deterministic algorithms, NP-Hard and NP-Completeproblems, Classes P and NP, Reducibility, Satisfiability Problem,Cook‟s theorem.

Approximation: Graph Coloring, Task scheduling, bin packing, **Probabilistic algorithm :**Numericalintegration, primality testing, **Graph Algorithms:** BFS and DFS and its applications.

5.Evaluation of Algorithm

Lower bound Techniques: Lower bound techniques, Comparison Techniques, reduction.

Readings:

1.The Design and Analysis of Computer Algorithms,A.Aho, J. Hopcroft and J.Ullman, Addison Wesley.

2.Fundamentals of Computer Algorithms, E. Horowitz and S. Sahani, Galgotia, New Delhi.

3.Introduction to the Design and Analysis of Algorithms ,S.E.Goodman and S.T.Hedetniemi, McGraw Hill.

4.Design Methods and Analysis of Algorithmics,G.Brassard and P.Bratley, PHI.

5.Design Methods and Analysis of Algorithms, S.K.Basu, PHI, 2005.

6.Introduction To Algorithms, Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein ,MIT Press

7.Rosen, Kenneth, Discrete Mathematics and Its Applications, McGraw-Hill Science

8.W. W. Rouse Ball (1960) The Eight Queens Problem, in Mathematical Recreations and Essays, Macmillan, New York, pp 165-171.

CAPBTT2

SOFTWARE ENGINEERING

1.**Introduction:** The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, s. Process models: The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process.Models, Capability Maturity Model Integration (CMMI).

2.**RequirementAnalysis**: Functional and non-functional requirements, User requirements, System requirements,Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS.

3.**SoftwareProjectManagement**: Estimation in Project Planning Process, Project Scheduling.

4.**RiskManagement**: Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.QualityManagement . Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

5.**DesignEngineering**: Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

Software Measurement and Metrics: Various Size Oriented Measures: Hallstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity

6.**TestingStrategies&Tactics**: Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing.

Recommended Books:

1. R.S. Pressman, Software Engineering: A Practitioner_s Approach (7th Edition), McGraw-Hill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2 nd Edition), Narosa
3.Publishing House, 2003. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8 th edition), Addison Wesley, 2006. \
5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.
6. R. Mall, Fundamentals of Software Engineering (2 nd Edition), Prentice-Hall of India, 2004.

CAPBTT3

Optimization Techniques

1.Introduction: Introduction to OR, The Nature and Meaning of OR, History, Management Applications of OR , Principles, Characteristics, Scope of OR.

2.Linear Programming-Introduction and Applications of LP, Limitations of LP Formulation of a LPModel,Graphical Solution of a LPP, Simplex Method, Two Phase Method, Big-M Method, duality in LPP.

3.Transportation Problem –Introduction, Mathematical Formulation, Feasible Solution and OptimumSolution(simple case only).

4.Assignment Problem –Introduction, Mathematical Formulation, Traveling Salesman Problem,elementary Problems, Replacement Problems-Types, Simple Replacement Problems.

5.Project Management by PERT-CPM –Introduction, History & Applications, Basic Steps, NetworkDiagram Representation, Rules, Time Estimates and Critical Path in Network Analysis, Uses and Applications of PERT/CPM.

Readings:

1. Operations Research By H.A.Taha
2. Operations Research By V.K.Kapoor
3. Operation Research By S.D. Sharma

CAPBTD1

ELECTIVE-III (1)

E-Commerce

1.**Introduction:-**Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.

2.**E-Commerce Models:** Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

3.**Electronic Payment Systems:** Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.

4.E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

5.**Security Issues in E-Commerce:** Security risk of E-Commerce, Types of threats, Security toolsand risk management approach. Cyber laws, Business Ethics, EDI Application in business.

Readings:

1.Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.

2.Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH

3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, New Delhi

CAPBTD2

ELECTIVE-III (2)

Cloud Computing

1.Fundamental Cloud Computing-Concepts, terminology, technologies, benefits, challenges, SLAs andbusiness cost metrics associated with cloud computing,SaaS, IaaS, PaaS delivery models, common cloud deployment models, and cloud characteristics. Various applications of cloud computing.

2.**Cloud Architecture:** The technology architecture of cloud platforms and cloud-based solutionsand services and their utilization via a set of cloud computing design patterns. hybrid cloud deployment models, compound design patterns, and solution architectures that span cloud and on-premise environments.

3.**Cloud Security &Governance**:**Cloud Security** :The cloud security mechanisms, A cloud securityarchitecture. a set of security design patterns.

Cloud Governance: the definition of cloud governance precepts, roles, practices, and processes, common governance challenges and pitfalls specific to cloud computing.

4.Cloud Storage: The cloud storage devices, structures, and technologies, cloud storage mechanisms,persistent storage, redundant storage, cloud-attached storage, cloud-remote storage, cloud storage gateways, cloud storage brokers, Direct Attached Storage (DAS), Network Attached Storage (NAS), Storage Area Network (SAN), various cloud storage-related design patterns.

5.Cloud Virtualization&Microservices: Core topic areas pertaining to the fundamental virtualizationmechanisms and types used within contemporary cloud computing platforms are explored, along with various key performance indicators and related metrics. Microservices of Cloud Computing.

Readings

1.Distributed Computing by Dollymore Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India

2.Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M.Goscinski, Wile, 2011 Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

CAPBTD3

ELECTIVE-III (3)

Neural Networks and Deep Learning

1.Introduction to biological neuron, artificial neuron, biological neuron vs. artificial neuron, evolution of neural networks, basic models of artificial neural networks(ANN) : connections, learning :- supervised, unsupervised, reinforcement, activation functions, important terminology of ANN. McCulloh-Pitts neuron, linear separability, types of neural networks.

2.Perceptron Networks, implementation of AND gate, OR gate, NAND gate etc., Gradient descent algorithm, implementation of AND gate, OR gate, NAND gate etc., Building a neural controller for obstacle avoidance, Pseudo inverse solution, nonlinear separability, Back propagation(BP) networks, Derivation of BP algorithm for single hidden layer architecture, momentum terms, implementation of XOR problem using BP algorithm.

3.Radial basis function neural network (RBFNN): architecture, training algorithm, Recurrent neural network(RNN) : architecture, training algorithm, Back propagation through time (BPTT). Real time recurrent learning algorithm(RTRL), Functional link artificial neural networks (FLANN): architecture, training, delta learning rule, Extreme Learning Machine(ELM): architecture, learning algorithm, Modified multilayer neural network, modified Back propagation (BP) algorithm, Self-organizing map(SOP)

4.Deep Learning : Introduction, Long short term memory(LSTM) network, Convolution neural network, Boltzman Machine network.

5.Applications: function optimization, classification, prediction, detection

Readings:

1.Neural Networks and Learning machines by Simon Haykin, PHI, 3rd Edition

2.Neural Network Design by M. Hagan, 2nd Edition, eBook

3.Principles of Soft Computing by S. N. Shivanandam and S. N. Deepa, Wiley, 2nd Edition

4.Artificial neural networks by B. Yegnanarayana, PHI.

5.Deep Learning by John D. Kelleher, MIT Press.

6.Neural networks and Deep learning by Charu C. Aggarwal, Springer, 1st Edition, 2018.

7.Research papers

CAPBTD4

ELECTIVE-IV (1)

Web Technology

1.Internet Concept: Fundamental of Web, History of Web, Web development overview, Domain NameSystem (DNS),DHCP,and SMTP and other servers ,Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture ,Web Browser and Web Server.

2.HTML and DHTML:- HTML Tag, Rules of HTML, Text Formatting and Style, List, AddingGraphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML, Introduction to DHTML, CSS, Class and DIV, External Style Sheet.

3.**Scripting Languages:** Java Script (JS) in Web Page, Advantage of Java Script, JS objectmodel and hierarchy ,Handling event, Operators and syntax of JS, JS Function, Client side JS Vs Server side JS ,JS security, Introduction to VB Script, Operator and Syntax of VB Script, Dialog Boxes, Control and Loop, Function in VBS.

4.XML: Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitiveadvantage with XML, Programming in XML, XML Schema ,XSLT ,DOM structure model ,XML quires and transformation.

5.Active Server Page (ASP): Introduction ,Internet Information System (IIS),ASP object ,Server object,File system object, session ,Accessing data base with an ASP page ,ODBC – ADO connection object, common methods and properties, ADO record set object .Introduction to ASP.Net.

Readings:

1.The complete Reference By Thomos A. Powell, TMH publication

2.Web Technology: A Developers Perspective, N.P.Gopalan ,J.Akilandeswani,PHIPublication.

3.Java Script: The definite Guide By Flangam ,O‟Reilly

4.Java Script: Developers Resource by Kamran Husain and Jason Levitt PTR-PHI publication.

5. “Mastering VB Script” BPB Publication.

6.World Wide Web design with HTML by Xavier Tata McGraw Hill Publication

7.XML By Example, Sean Mc Grath Pentice Hall Publication.

8.WebTechnology: A Developments Perspective, N.P. Gopalan, J. Akilandeswari, PHI Publication

CAPBTD5

ELECTIVE-IV (2)

Digital Image Processing

1.**Digital Image Processing (DIP):** Introduction, examples of fields that use DIP, fundamental stepsin DIP, components of an image processing system. **Digital Image Fundamentals:** elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

2.**Image Transforms:** Two-dimensional (2D) impulse and its shifting properties, 2D continuousFourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT. **Other transforms and their properties:** Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

3.**Image Enhancement: Spatial domain methods**: basic intensity transformation functions, fundamentalsof spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method. **Frequency domain methods:** basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low passfilters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

4.**Image Restoration:** Image degradation/restoration, noise models, restoration by spatial filtering, noisereduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

5.**Image Compression**: **Fundamentals of data compression**: basic compression methods: Huffmancoding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

Readings

1.Gonzalez and Woods: Digital Image Processing, Pearson Education.

2.Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.

3.Annadurai: Fundamentals of Digital Image Processing, Pearson Education.

4.Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.

5.Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.

6.Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.

7.William K. Pratt, Digital Image Processing, Wiley India.

CAPBTD6

ELECTIVE-IV (3)

Pattern Recognition

1.**Pattern Concept:** Meaning of pattern, examples of patterns, importance of study of patterns in machinelearning, meaning of labels, attributes, features, dimensions in patters with examples, pattern recognition and classification, meaning of machine learning

2.**Pattern Recognition and classification:** Meaning and importance in machine learning, supervised andunsupervised learning with meaning and examples, classifiers, k-nn classification and k-means clustering, implementation and applications

3. **Decision Trees:** Meaning of tree and hence decision tree, building a decision tree, decision treeinduction, classification using a decision tree, classification using ID3

4.**Evolutionary Computing:** Meaning of evolutionary computing, various operators used in evolutionarycomputing, genetic algorithms and their applications, Particle Swarm Optimization and their applications, Multi-objective Genetic Algorithms with examples

5.**Ensemble of classifiers:** Meaning and importance of ensembles, boosting and AdaBoost algorithm,bagging and random forest, weak and strong learning, ensembles of classifiers with voting

Readings:

1. Pattern Classification: Duda, R.O, Peter Hart, David Stork, 2010, Wiley India
2. Data Mining: Concept and Techniques, Morgan and Kaufmann, 2001
3. Pattern Recognition: RajjanShinghal, Oxford University Press New Delhi, 2006

4.Ensemble Methods, Foundations and Algorithms, Zhi-Hua Zhou, A CRC Press, Chapman and Hall Book, 2010

5.Pattern Recognition, RobiPolikar, Wiley Encyclopedia of Biomedical Engineering, 2006 John Wiley & Sons, Inc

CAPCTT1

Machine Learning

1. **Introduction**: Meaning and need of Machine Learning, Types of Machine Leaning: Supervised Learning, Unsupervised Learning, Semi Supervised Learning, Reinforcement Learning, Applications of Machine Learning, Type of Data in Machine Learning, Data Repository

2. **Introduction to Feature Analysis and Bayesian Theory**: Meaning of patterns and pattern classification, feature selection and curse of dimensionality, Bayesian theorem and concept learning, examples.

3. **Supervised Learning**: Introduction to supervised learning, its examples, classification models, classification algorithms with Implementation: k-nearest neighbor (kNN), Decision Tree, Random Forest, Support Vector Machine (SVM),

4. **Unsupervised Learning**: Introduction to unsupervised learning, metrics for evaluating a feature, Clustering, types of clustering techniques, partitioning, hierarchical and density based clustering

5. **Modeling a classifier**: Validation, classification and prediction accuracy, confusion matrix, learning, bootstrap aggregation (bagging) , boosting, ensembles for classification

Readings:

1.Pattern Classification 2nd Edition By R.O. Duda, Hart, Stork (2001) ,Johnwiley, New York.

2.Pattern Recognition : Technique and Applications By Shinghal (2006) ,Oxford University Press, New Delhi.

3.Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006

CAPCTT2

Computer Graphics and Multimedia

1.Fundamentals of Computer Graphics: Concepts and applications, Random and Raster scandevices, input-output devices: CRT, LCD, laser printer. Output primitives: Line drawing algorithm: DDA and Bresenham‟s; Circle generating algorithm: Bresenham‟s Midpoint algorithms, Ellipse: midpoint ellipse drawing algorithm. Antialising techniques: super sampling, pixel weighting, area sampling, pixel phasing Area filling: boundary fill algorithm, flood fill algorithm: Scan-line Polygon Fill Algorithm.

2.Transformation, viewing, Clipping: 2-D Transformation: Translation, scaling, rotation,reflection, shear, matrix representation of all homogeneous coordinates, composite transformations. Two dimensional viewing: Viewing pipeline Window-to-view port transformation. Clipping operations: Line Clipping: Cohen Sutherland and Liang-barsky, Polygon Clipping: Cohen-Sutherland-Hodgeman and Weiler – Atherton Polygon clipping.

3.3D Transformation, Visible Surface Detection and curves: Visible Surface detectionAlgorithm: Object based and image based methods, depth comparison, A-Buffer, Back face removal, Scan-line method, Depth Sorting Method Area subdivision method. 3-D Transformation: translation, scaling, rotation, reflection. Three- dimensional object representations 3-D Viewing Projections – parallel and perspective projection. Curved lines and Surfaces: Spline representations, Interpolating and approximation curves, continuity conditions Bezier curves: concept and characteristics; B-Spline curves: concept and characteristics.

4. **Color Models and Basic Concept of Animation:** Introduction of multimedia: Properties andapplications, types of medium, data stream characteristics, Basic File and Data format: BMP,JPEG,GIF, TIFF. Color models: RGB, YIQ, CMY, HSV. Animation: Basic concept, animation languages, computer-based animation, methods of controlling animation, display of animation, animation techniques: onion skinning, motion cycling, masking, morphing, and transmission of animation, Multimedia Authoring tools.

5.Multimedia Systems: Data compression: storage space, coding requirements. Source, entropy andhybrid coding some basic compression technique: runlength code, Huffman code. JPEG: Image preparation, Lossy sequential DCT –based mode, expanded Lossy DCT based mode, Lossless mode,and hierarchical mode. MPEG, Huffman Encoding, LWZ compression.

Readings:

1. Principles of interactive compo Graphics; W.M. Newman & Robert F Sproull.
2. Computer Graphics By Rogers TMH
3. Introductions to Computer Graphics AnirbanMukhopadhyay&Arup Chattopadhyay
4. Schaum's outlines -computer Graphics Mc Graw Hill International Edition.5
5. Principles of Multimedia by Ranjan Parekh TMH
6. "Multimedia Systems Design", P. K.Andleigh& K. Thakrar, Prentice Hall Pvt. Ltd

CAPCTT3

Data Mining and Data Warehousing

1.Data Mining: Meaning, necessity, steps, Normal searching Vs. knowledge extraction.

2. **Data Mining on different types of databases:** Relational, Data Warehouses, Transactional, Objectoriented, Object relational, Spatial, Temporal and time series, Text and multimedia, Heterogeneous and legacy.

3. **Data Warehouse:** Meaning, definition, OLTP Vs. OLAP, Data cube, star schema, snow flake schema, **fact** constellations, basic concepts in writing of DMQL, Three Tier Architecture of data warehouse, data mart, Indexing.

4. **Data Preprocessing :**Data cleaning, Data integration, Chi-square test, Data transformation, Data reduction, Dimensionality reduction : Principal component analysis (PCA), factor analysis (FA), Data compression : discrete Fourier Transform(DFT), discrete cosine transform (DCT), discrete Wavelet transform(DWT)

5. **Classification, Clustering and Prediction:** Meaning, k-nearest neighbourhood (k-NN), Neural network based classification, Support vector machine(SVM) classifier, Naïve Bayes classifier. Clustering : types of variables, distance measures, types of Clustering, Partioning Method: k-means, k-medoid clustering, Unsupervised : Hierarchical clustering, Prediction using Regression, nonlinear regression and Neural Network, Performance Measures. Types of training: holdout method, cross validation, leave-one-out method.

6.Association rule mining: Market basket analysis, support, confidence, Apriori algorithm

Readings:

1.Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber,MorganKaufmann Publishes (Elsevier, 2nd edition), 2006.

2.Data Mining Methods for Knowledge Discovery, Cios, Pedrycz, Swiniarski,Kluwer Academic Publishers, London – 1998.

CAPCTD1

ELECTIVE –V (1)

Big Data Analytics

1.**Understanding Big Data**: Datasets, Data Analysis, Data Analytics-Descriptive Analysis,Diagnostics Analytics, Predictive Analytics, Prescriptive Analytics, Big Data Characteristics – volume, velocity, variety, veracity, value, Different Types of Data – Structured Data, Unstructured Data, Semi-Structured Data

2.**INTRODUCTION HADOOP**: Big Data–Apache Hadoop & Hadoop EcoSystemMovingDatain and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

3.**HADOOP ARCHITECTURE** : Hadoop Architecture, Hadoop Storage: HDFS, Common HadoopShell commands , Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup– SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

4.**Theory and methods for big data analytics**: Regression Modeling, Multivariate Analysis, BayesianModeling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Decision Trees.

5.**Programming with R** : Basic Syntax, Data types, Variables, Operators, Decision Making, Loops,Functions, Vectors, lists, Matrices, Arrays, Data Frames, R Data Interfaces – CSV Files, Excel Files, Database, R charts & graphs , R statistics – Mean, Median, Mode, Linear Regression.

Readings:

1. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
2. “Big Data Fundamentals: Concepts, Drivers & Techniques”, 1/e, 2016, Thomas Erl, Wajid Khattak,Paul Buhler, Prentice Hall.
3. “Big Data Analytics with R and Hadoop”, 1e, 2013, Vignesh Prajapati, Packt Publishing Ltd, UK.
4. “The Art of R Programming: A Tour of Statistical Software Design”,revised,2011, Norman Matloff,No Starch Press
5. "Hadoop:The Definitive Guide," 3/e, 2012, Tom White, O'REILLY Publications.
6. "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data" ,2012, Paul Zikopoulos, IBM, Chris Eaton, Paul Zikopoulos, The McGraw-Hill Companies.
7. "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications",2014, Bart Baesens, Wiley Publications.
8. “Mining of Massive Datasets”, 2012, Anand Rajaraman and Jeffrey David Ullman ,CambridgeUniversity Press

CAPCTD2

Elective-V (2)

Advanced Operating System

1.Advanced Course in Operating System, Distributed Systems, Communication in distributed systems, processes and processors in distributed systems. Threads, systems Models, Process allocation, scheduling in distributed systems, fault tolerance, real-time distributed systems.

2.Theoretical issues in distributed systems: Logical clock, mutual exclusion, deadlock detection, agreement protocols, resource security and protection, concurrency control.

3.Distributed File System: Design and implementation, trends. Distributed shared Memory, consistency models, page-based distributed shared memory, shared variable distributed shared memory, object-based distributed shared memory.

4.Multiprocessor OS, Database OS: General features and theoretical issues.

5.Case Studies: Amoeba, Mach, chorus, DCE, etc. Multimedia Operating Systems: Process scheduling, File system, caching, Disk scheduling for multimedia.

Readings

1.A.S. Tanenbaum, Distributed Operating System, Prentice-Hall, 1995.

2.A.S. Tanenbaum, Modern Operating Systems, Pearson Education Asia, 2001.

3.M. Singhal and N. G. Shivaratri, , Advance Concepts in Operating Systems, McGraw-Hill, 1994.

4. W. S. Liu, Real-Time Systems, Pearson Education, 2000.

CAPCTD3

ELECTIVE-V (3)

Data Science using Python

1.**Introduction to Python:** Introduction to python, variable, data type, control statements, loop statements, functions.

2.**Python for Data Science:**Numpy, Pandas, Matplotlib ,Seaborn etc.

3.**Introduction to Data Science:** Introduction to data science, Overview of the data science process, Data Preprocessing.

4. **Machine Learning :** Introduction to machine learning, Linear regression and regularization, Model selection and evaluation, **Classification:** KNN, decision trees, SVM.

5.**Clustering:** K-means, hierarchical clustering,
Dimensionality reduction: PCA and SVD, Text mining and information retrieval, Network analysis,

Readings

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in Springer, 2013.
2. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.
3. Hastie, T., Tibshirani, R., Friedman, J. The elements of statistical learning 2nd edition Springer.
4. Murphy, K. Machine learning: A probabilistic perspective, MIT Press.
5. Manning :Big Data using Python

CAPCTD4

ELECTIVE-VI (1)

Compiler Design

1.Basics of Compilers and Lexical Analysis: Compilers and Translators, Bootstrap compiler, Phases ofCompiler, Compiler writing tools, Bootstrapping, Overview of one pass compiler, Finite Automation, Basics of DFA, NFA, Regular sets and Regular expressions.

2.Syntax analysis & Parsing techniques: Basics of context free grammars and derivation of parse trees,Top down parsing and its implementation, Operator precedence parsing, Predicative top down parser, Bottom up parsing, Handel of right sentential form, LR parser, Canonical collection of sets, Construction of parsing action and GOTO table, Construction of LALR parsing table, Handling ambiguous grammar.

3.Syntax directed definition and Translation: L-attributed definition, Syntax directed translationscheme, Intermediate code generation**,** Representing three address statements, Syntax directed translation scheme to specify the translation of various programming language construct, Implementing increment and decrement operators, Array reference, Switch/case.

4.Symbol table management & Error Handling: Various approaches to symbol table organization,Representation of scope information in symbol table, Storage allocation activation of procedure and record, Static allocation and stack allocation. Error recovery, Error recovery in LR parsing, Predicative parsing error recovery.

5.Code Optimization and Code Generation : Introduction, Loop optimization, Eliminating inductionvariable, Eliminating local common sub expression, DAG, Eliminating global common sub expression, loop unrolling, loop jamming, Problems hindering code generation, Straight forward code generation, Using DAG for code generation, Peephole optimization.

Readings:

1.Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman. “Compilers Principles, Techniques and Tools”.Pearson Education,2008.

2.O.G.Kakde, “Compiler Design”, 2005, Laxmi Publication.

3.AdeshK.Pandey“ Concepts of Compiler Design ”, First Edition, S.K.Kataria&SonsPublication.

4.Steven S. Muchnick, “Advanced Compiler Design Implementation”,Morgan Koffman,1997. 5.AllenHolub, “Compiler Design in C”, Prentice Hall of India, 1990.

CAPCTD5

ELECTIVE-VI (2)

Network Security

1.Foundations of Cryptography and security: Security trends, The OSI Security architecture Securityattack, services and mechanism**,** Ciphers and secret messages, Mathematical tools for cryptography: substitution techniques, modular arithmetic, Euclid's algorithm, finite fields, polynomial arithmetic.

2.Symmetric Cipher: Symmetric cipher model, Design Principles of Block Ciphers, Theory of BlockCipher Design, Feistel cipher network structure, Data Encryption Standard (DES), Strength of DES Triple DES ,Modes of operation.Advance encryption Standard (AES)-Evaluation criteria of AES,AES cipher ,key distribution.

3.Public Key cryptography and Hash function: Prime numbers and testing for primarily, factoring largenumbers, Principles of public key cryptosystem, RSA algorithm. Key management: Diffie-Helman Key exchange, Hash and Message authentication Code (MAC), Hash and MAC algorithms, Digital signature.

4.IP and Web security protocols: Authentication application: Kerberos, Public key infrastructure .E-mail:Pretty Good Privacy (PGP), S/MIME. IP security, Web Security: Secure Socket layer (SSL) and Transport layer security, Secure Electronic Transaction (SET).

5. **System Security**: Firewall, and Intrusion Detection system (IDS), Malicious Software.

Readings

1.Cryptography and Network Security By William Stallings, 4th Edition Pearson Publication

2. Applied cryptography - protocols and algorithm By BuceSchneier, Springer Verlag 2003
3. Cryptography and Network Security By Atul Kahate , TMH Publication.
4. Cryptography and Network Security By Behrouz A. Forouzan, First Edition, TMHPublication.
5. Network Security: Private Communication in Public World By Charlie Kaufman, Radia Perlman and Mike Speciner ,PHI Publication.

CAPCTD6

ELECTIVE-VI (3)

Parallel Processing

1.Introduction to parallel processing: Trends towards parallel processing; Parallelism in Uniprocessorsystems: Basic Uniprocessor Architecture, Parallel Processing mechanisms, Multiprogramming andTime Sharing; Parallel Computer Structures: Pipeline computers, Array computers, Multiprocessor systems, Performance of Parallel Computers; Architectural classification schemes; Parallel processing applications.

2. **Principles of Pipelining and Vector Processing:** Principles of Linear Pipelining, Classification ofPipelined processors, General pipelines & Reservation tables, Instruction and Arithmetic Pipelines: Design examples and principles of design, Vector Processing: characteristics, Multiple Vector Task Dispatching, Pipelined Vector Processing methods. Architecture of Cray-I.

3.Structure of Array Processors- SIMD Array Processors: Organizations, Masking and Data RoutingMechanisms; SIMD Interconnection Networks: Static, Dynamic, Mesh-Connected, Cube Interconnection Networks, Shuffle Exchange, Omega Networks; Performance Enhancement methods; Associative Array processing: Associative Memory Organization, Associative Processors.

4.Multiprocessor Architecture: Functional Structures–Loosely Coupled and Tightly coupledmultiprocessors; Interconnection Networks for multiprocessors: Crossbar Switch and multiport memories, Multistage Networks for multiprocessors; Exploiting Concurrency for multiprocessors, Parallel Memory Organizations: High order & Low order interleaved memory; Multiprocessor Scheduling strategies, Interprocess communication mechanisms: Process Synchronization Mechanisms, Synchronization with Semaphores, Conditional critical section & monitors.

5.**Algorithms on Array processors; Parallel Algorithms on Array Processors-** SIMD MatrixMultiplication, Parallel Sorting on Array Processors, SIMD Fast Fourier Transform, Parallel Algorithms of Multiprocessors-Classification of Parallel Algorithms, Synchronized Parallel Algorithms, Asynchronous Parallel Algorithms, Performance of Parallel Algorithms.

Readings

1. Computer Architecture & parallel Processing- Kai Hwang & A. Briggs (McGraw Hill)
2. Designing Efficient Algorithms for Parallel Computers – H.J. Quinns (McGraw-Hill)

3.Advanced Computer Architecture: parallelism, Scalability, Programmability- By:Kai Hwang(TMH) 2. Computer Organization & Programming – By – Gear (TMH)

4. Parallel Processing for Supercomputers & Artificial Intelligence –By – Hwang &Degroo

CAPDPF1

MAJOR PROJECT

GUIDELINES FOR PROJECT WORK (MCA)

A project report has to be submitted as per the rules described. Some additional guidelines regarding the Project Report are:

Number of Copies:

The student should submit One hardbound copy of the Project Report with one RW/CD/DVD.

Acceptance / Rejection of Project Report:

The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.

Format of the Project Report :

The student must adhere strictly to the following format for the submission of the Project Report

a. Paper

The Report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The Report to be submitted to the University must be original and subsequent copies may be photocopied on any paper.

b. Typing

The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons.

c. Margins

The typing must be done in the following margins

Left ----- 35mm, Right 20mm

Top ----- 35mm, Bottom ----- 20mm

d. Binding

The Report shall be Rexene bound in black. Plastic and spiral bound Project Reports not be accepted.

e. Front Cover:

The front cover should contain the following details:

TOP : The title in block capitals of 6mm to 15mm letters.

CENTER : Full name in block capitals of 6mm to 10mm letters.

BOTTOM : Name of the University, year of submission- all in block capitals of 6mm to 10mm letters onseparate lines with proper spacing andcentering.

f. Blank Sheets

At the beginning and end of the report , two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

Abstract

Every report should have an Abstract following the Institute‟s Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.

The report should contain the following:

Certificate from Company
Institute Certificate: Successful completion of project by competent authority.
Acknowledgments
Abstract
List of
Figures
Tables
Nomenclature and Abbreviations

Contents of the Project Report

1.Company Profile (only for M.I.S. projects)

2.Introduction to the project

3.Scope of work.

4.Existing System and Need for System.

5.Operating Environment - Hardware and Software.

6.Proposed System.

6.1 Objectives to be fulfilled

6.2 User Requirements

6.3 Requirements Determination Techniques and Systems Analysis Methods Employed.

6.4 Prototyping.

6.5 System Features

-Design of Input

-Design of Output screens and reports -
Module specifications

-D.F.D.‟s and ER‟s -

System flow charts -Data

Dictionary -Structure

charts -Database /File

layouts -User Interfaces -

Coding system

-Design of Control Procedures -

Design of Exception Handling

7.Testing procedures and Implementation Phases

8.Acceptance Procedure

9.Post-Implementation Review

10. User Manual

Menu explanation -
User guide

-Expected problems/errors and their solutions

11. Problems encountered

12. Drawbacks and Limitations

13. Proposed Enhancements

14. Conclusions

15. Bibliography

Annexure:

-Sample documents (manual or computer generated) -
Source code listing in a separate file

-Output reports

List of Tables:

The Contents shall be followed by a „List of Tables‟ indicating the table number, table title and the corresponding page number(s).The table number shall be in decimal point notation indicating the chapter number and the table number in that chapter.

NOTE : Any reference within the text shall be given by quoting relevant number.eg: „Table5.2‟

List of Figures:

The „List of Figures, shall follow the „List of Tables‟ indicating the figure numbers, figure titles and corresponding page number. The figure numbers shall be in decimal point notation.

Nomenclature and Abbreviations:

The „Nomenclature and Abbreviations‟ shall follow the „List of Figures‟ and contain the list of symbols and abbreviations and their long names used. The nomenclature should be given for ER‟s, DFD‟s, STRUCTURED CHARTS, and RUN CHARTS and for all other symbols in the techniques used. The nomenclature for every technique should appear on a separate sheet. As far as possible, accepted standard symbols shall be used.

Chapter Numbering:

The Chapters shall be numbered in Arabic numerals. Section and subsections of any chapters shall be in decimal notation. All chapters shall begin on a new page. The titles for the chapters and the title shall be properly centered at the top of the page and have three spaces between them.

Company Profile:

This chapter should highlight the company details. This would be chapter 1 and should include the main stream activity of the company, the product line of the company and the details of the department where the student was working. This should not exceed two pages or 800 words.

N.B. : Only relevant for M.I.S. Projects.

Introduction:

The „Introduction‟ shall highlight the purpose of project work It will also define the chapters to be followed in the Project Report.

Existing System and the Need for the System:

If there is some system already in use, then a brief detail of it must be included, to help the examiner understand the enhancements carried out by6 the student in the existing system. Based on this, the student should exemplify the need for the computerization should be given.

N.B. : Only where relevant.

Proposed System :

1. Objectives: Clearly define the objective(s) of the system in a few lines.

2.User Requirements: State the requirements of the use in an unambiguous manner.

3.Requirements Determination Techniques and System Analysis Methods Employed:

Use the formal methods to describe the requirements of the use. Like Fact Finding Methods, Decision Analysis, Data Flow Analysis etc.

4.Prototyping : If the prototypes has been developed prior to the detailed design , then give details of theprototype.

5.System Features:

5.1Design of Input : Inputs, Data Dictionary, Screens.

5.2Design of Output: Outputs, Reports etc.

5.3Design of Control Procedures : Structured charts, Module Specifications, Run charts etc.

5.4Design of Exception Handling : Error handling and recovery procedures

The choice of including topics in this chapter entirely depends on the student. The freedom given for this chapter is obvious. Students will be working on various types of projects. A typical M.I.S. development project must include DFD‟s and structured charts etc. Thus a student is allowed to employ the techniques of his/her own choice suitable to his/her work. However, there is a guideline that the student must employ the techniques taught during the MCA course.

BRIDGE COURSE

MCA_BRIDGE_1

Fundamentals of Computer Science

1. **Introduction** -Introduction, Fundamental uses of computers, Types of Computers, Generations of Computers. Input Devices: Keyboard, Mouse, Track ball, Joystick, Scanner, Digital Camera, MICR, OCR, Barcode Reader, Touch Screen, Light Pen. Output Devices: Monitor, Printer, Plotter, Sound Card and Speaker. Memory Unit: RAM, ROM, PROM, EPROM, and EEPROM, Auxiliary Storage Devices: Magnetic storage devices-Floppy Diskettes, Hard disks, Removable Hard disks, Magnetic Tapes. Optical Storage- CD-ROM.

2. **Application of Computer Software:** Machine Language, Assembly Language, High Level Language, Types of High Level Language, Compiler and Interpreters, System software, Application Software, Utility software, Firmware. **Computer Virus** - Introduction, Virus, A few Prominent Viruses, Types of Computer Virus, Antivirus software.

3. **Computer Network and Internet:** Basic concept of Computer Network, protocol, Communication Process, Communication Types, topology, types of Network: LAN,WAN,MAN, Types of Network devises, Concept of Internet; Applications of Internet, World Wide Web, Web Browsing software, Search Engines; Understanding URL; Domain name; IP Address, E-mail.

4. **Computer Organization:** Number System, 1's and 2's complement system, 2's complement addition(Signed / Unsigned), Logic gates, Half adder, Full adder, Multiplexer, De-Multiplexer, Encoder, Decoder, Flip Flops, Shift register.

5. **Data Structure:** Basic concept of Data Structure, Array, Stack, Queue, Link List, Tree, Graph.

Readings:

1. Fundamental of Computer 5th Edition By V. Rajaraman, PHI Publication.
2. Fundamental of IT: Leon and Leon, Leon Tec World.
3. Data Structure ByLipshutz, McGraw Hill.
4. Data structures Through C by G. S. Baluja.

5. Computer System Architecture, 3rd Edition. M. Morris R. Mano, Pearson publication.

MCA_BRIDGE_2

1. **C Basics:** History of C, Characteristics of C, C Program Structure, data types, Enumerated types, Variables, Defining Global Variables, Printing Out and Inputting Variables, Constants, Arithmetic Operations, Comparison Operators, Logical Operators, Order of Precedence, Escape sequence characters, Conditionals (The if statement , The switch statement) Looping and Iteration (The for statement, The while statement, The do-while statement, break ,continue, goto statements).

2. **Functions:** Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments. **Arrays**: Single and Multi-dimensional Arrays, Accessing individual elements in an Array, Manipulating array elements using loops, Pointers: Pointer declaration, Pointers arithmetic, Pointer to an array, Array of pointers, Function pointers, Dynamic Memory Allocation and Dynamic Structures: malloc, calloc and realloc; sizeof, free, **String functions**.

3. **Structure and Union:** Definition, Programs using Structure and Union, Difference between Structure and Union, User defined data types (typedef), Self referential structures The C Preprocessor: Macros, File inclusion, Other Preprocessor Commands).

4. **File Handling:** Opening and Closing data files, Read and Write Functions, different modes of Files, Library functions for file handling, Command Line Argument.

5. **Introduction to C++:** Features of C++, Structure of C++ program, Object and Class: Defining class, Abstract class ,Function prototype, Function with parameter ,Passing object as a parameter, Constructor function , Destructor function, Friend function , Polymorphism, Inheritance, Virtual class , virtual function.

Reading

1.E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
2.Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
3.John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
4.Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.
5.Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
6.Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014

7.Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
8.Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

SYLLABUS M.Sc. (CS)

(The scheme and syllabi of any programme can be modified from time to time, students are advised to refer to University website for updates if any/ consult their respective teachers)

Department of Computer Science & Information Technology Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

SYLLABUS FOR MSC COURSE UNDER CHOICE BASED CREDIT SYSTEM (CBCS) *

Session 2017-18(on and after)

M.Sc. (CS)

Note: The decision of the GG Vishwavidyalaya for implementing CBCS system on this course shall be final, rest will remain the same.

Semester 1

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-101	Introduction to Information Technology	4		40	60	4
2	MSC-102	Computer programming & Numerical Methods	4		40	60	4
3	MSC-103	Discrete Mathematical Structures	4		40	60	4
4	MSC-104	Data Structures using C	4		40	60	4
5	MSC-105	Computer Organization	4		40	60	4
6	MSC-106	LAB-I: Data Structure using C		1		100	1
7	MSC-107	LAB-II: Computer Hardware and Digital Electronics		1		100	1
		Total	20	02	200	500	22

Semester 2

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-201	Principles of Operating system	4		40	60	4
2	MSC-202	Object Oriented Programming with C++	4		40	60	4
3	MSC-203	Theory of Computation	4		40	60	4
4	MSC-204	Elective I	4		40	60	4
5	MSC-205	Elective II	4		40	60	4
6	MSC-206	OOP Lab (C++)		1		100	1
7	MSC-207	LAB based on Elective-II		1		100	1
		Total	20	02	200	500	22

Semester 3

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MSC-301	Probability and Statistics	4		40	60	4
2	MSC-302	Artificial Intelligence	4		40	60	4
3	MSC-303	Relational Data Base Management System	4		40	60	4
4	MSC-304	Elective III	4		40	60	4
5	MSC-305	Elective IV	4		40	60	4
6	MSC-306	RDBMS LAB		1		100	1
7	MSC-307	LAB based on Elective III / IV		1		100	1
		Total	20	02	200	500	22

Semester 4

M.Sc. (CS)IVth Semester			
S.No.	Subject Code	Subject	Total Marks
1.	M.Sc. (CS)401	Major Project (Viva Voce)	500
Total			500

ELECTIVES

Sl.No	Paper Code	(1)	(2)	(3)
1	MSC-204 (Eletive-I)	Computer Networks	System Analysis and Design	Introduction to Micro Processor
2	MSC-205 (Elective-II)	Object Oriented Software Engineering	Multimedia	Linux Operating System and Shell Programming
3	MSC-304 (Elective-III)	Advanced JAVA Programming	System Software	Neural Network
4	MSC-305 (Elective-IV)	Web Technology	Pattern Recognition	Compiler Design

*** The syllabus is subjected to change as per the requirement.**

MSC-101

Introduction to Information Technology

1. **Introduction-** Basics concept of IT, Concept of data and information, Generations and Classification ofComputers, Organization of computers: CPU, Memory, Input and Output devices, File organizations.

2. **Software and Computer Languages-** Software, Types of software: System software, Application software,Utility software, Firmware. Generations and Types of Programming Languages, Programming Paradigms: procedural oriented and object oriented programming, Computer Security.

3. **Communications and Internet-** Data communications, Analog and digital signal, Communication media,Network topology, Network categories, The OSI model and TCP/IP model, Internet addressing, Internet Service Provider (ISP), Web browsers, URL, WWW, HTTP, E-mail, File transfer, Domain Name System (DNS), Wireless technology: GPS, Wi-Fi.

4. **Applications of IT-** IT in Home, Entertainment, Business, Industry, Science, Engineering and Medicine,Online banking, Online shopping, E-Learning, E-commerce, M-Commerce, E-Government.

5. **Latest IT Trends-** Artificial intelligence, Data warehousing, Data mining, Overview of geographicinformation system (GIS), Cloud computing, Information and communications technology (ICT), Parallel computing, Introduction to web services.

Readings:

1. Fundamental of Computer 5th Edition By V. Rajaraman, PHI Publication.
2. Introduction to Information Technology by V. Rajaraman, PHI Publication.
3. Information technology today By S. Jaiswal.
4. Fundamental of IT: Leon and Leon, Leon Tec World.
5. Introduction to Information Technology by Aksoy and DeNardis, Cengage Learning.

MSC- 102

Computer Programming and Numerical Methods

1. Introduction to C programming, Decision Making, Branching, Looping, Arrays &Strings,Functions and Pointers.

2. Algebraic Equation: Iterative Methods – Roots of a Single transcendental equations and roots of Polynomials using Bisection Method, False position Method , Newton Raphson Method.

3. Simultaneous Algebraic Equation :Gauss Elimination Method, Gauss-Jordan Method, Factorization Method, Jacobi's Iteration Method, Gauss- seidal Iteration Method. Matrix Inversion using Gauss Elimination and Gauss Jordan methods. Eigen Value and Eigen Vectors.

4. Interpolations: Newton Methods. Lagrange's Interpolation Formula and difference tables. Least Square Approximations- Linear regression only., Curve Fitting.

5. Differentiation and Integration- Formula for Numerical Differentiation and Numerical integration by Trapezoidal Rule and Simpson's rule only. Numerical Solution of Differential Equation :- Euler's Method, Taylor series Method, Runge Kutta Method.

Readings

1. Numerical Methods by B. S Grewal, Khanna Publishers, Delhi
2. Programming in ANSI C by E. Balguruswamy, Tata McGraw-Hill Education Pvt. Ltd
3. Numerical Methods By V. Rajaraman, 3rd Edition, Prentice-Hall India Pvt. Ltd.
4. Numerical Methods By S.S. Shastri, 4th edition, 2005,PHI publications.
5. LET US C By Y. Kanetkar, 14th Edition, BPB Publication.
6. Computer Based Numerical and Statistical techniques, P.K.Mittal and Mukesh B.,Galgotia Publication.

MSC-103

Discrete Mathematical Structures

1. **Mathematical Logic** : Notations, Algebra of Propositions & Propositional functions, logicalconnectives, Truth values & Truth table Tautologies & Contradictions, Normal Forms, Predicate Calculus, Quantifiers.**Set Theory**: Sets, Subsets, Power sets, Complement, Union and Intersection, De-Morgan's lawCardinality, relations: Cartesian Products, relational Matrices, properties of relations equivalence relation functions: Injection, Surjection, Bijection, Composition, of Functions, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.

2. **Boolean Algebra :**Truth values and truth tables, the algebra of propositional functions, booleanalgebra of truth values Axiomatic definitions of Boolean algebra as algebraic structures with two operations, Switching Circuits.

3. **Groups :**Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups.

4. **Graphs :**Simple Graph, directed graph, Degree of a Vertex, Types of Graphs, Sub Graphs andIsomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems, BFS ,DFS, Dijkastra's Algorithm, Representation of Graphs, Planar Graphs, Applications of Graph Theory.

5. **Matrices :**Addition, subtraction, multiplication, transposes.

Readings:

1. A text book of Discrete Mathematics BySwapan Kumar Sarkar (S. Chand & company Ltd.).
2. Discrete Mathematical structure with Applications to computer science By J.P Trembly & R.P. Manohar.
3. Discrete Mathematics By K.A Ross and C.R.B writht.
4. Discrete Mathematics Structures By Bernard Kohman& Robert C. Bushy.
   for computer science
5. Discrete Mathematics By Seymour Lipschutz Mare Lipson. Tata McGraw-Hill Edition.

MSC-104

Data Structure using C

1. **Introduction to Data Structures**: Definition of Data structure and Abstract data type. Basics of Algorithm. Classification of Data structures: Linear, Non-linear. Arrays: Definition & types of array, Memory representation of one & two dimensional array, Operations on DS. Linked List: Singly Linked list- Operation on it; doubly linked list- Operation on it; Circular linked list - Operation on it.

   Overview of C, loops, Functions: call by value and call by reference, Recursive function.Structure: Structure and applications of Structure in various DS. Pointer and applications of Pointer in dynamic memory allocation.

2. **Stacks, Queues:** Stacks; Array representation of stack; Linked representation of stack; Various polish notation's-Prefix, Postfix, infix; Evaluation of a postfix & Prefix expression; Conversion from one another; Application of stack; Queues; Linked representation of queues; Dqueues; Circular queue; Priority queue.

3. **Trees :**Binary trees; Types of binary tree Representation of binary tree in memory; traversing binary tree; Binary search trees; Searching and inserting in binary search trees; Deleting in a binary search ,tree; AVL search trees and operation on it . B trees: searching, insertion, deletion; Heap.

4. **Graphs :**Terminology & representation; Warshall algorithm; Shortest path; Minimum spanning tree; Kruskal &Dijkstara algorithm; Linked representation of graph; Operation on graph; Traversing a graph.

5. **Searching and Sorting:** Searching algorithm: linear search, binary search; sorting algorithms: Bubble sort, Insertion sort, Selection sort, Quick Sort, Merge sort and Heap sort.

Readings:

1. Programming in C “Yashwant Kanetkar”, BPB Publications,Tenth Edition.
2. The C Programming Language “Kemigham and Ritche [Prentice Hall]”
3. Data Structure ByLipshutz, McGraw Hill.
4. Data Structure By Standish, Addison-Wesley.
5. Data structures Through C by G. S. Baluja.

MSC-105

Computer Organization

1. **Number System**: Binary, Octal and Hexadecimal number system, Conversion from one number system toanother, Binary arithmetic, Representing negative numbers, BCD codes, ASCII codes, EBCDIC codes, Excess three code, Gray code, Floating point representation, 1's complement and 2's compliment,Arithmetic representation of signed binary numbers, 9's complement and 10's compliment system.

2. **Logic Gates and Boolean Algebra**: Properties and Symbolic Representation Of NOT, AND,OR,NOR,NAND ,EX-OR,EX – NOR GATES, NOR and NAND GATES as a universal gates, Laws and identities of Boolean algebra, Demorgan's theorem, Use of Boolean algebra for simplification of logic expression, SOP and POS forms, Canonical forms, Maxterm, Minterm, Karnaugh map for 2,3,4 variable.

3. **Combinational and Sequential Circuits:** Multiplexer, De multiplexers, Decoders, Encoders, Half adder, Fulladder, Half subtractor, Full subtractor, n-bit adder, Adder-subtractor, Flip flops, Registers, Counters.

4. **CPU Organization and Parallel Processing:** General register organization of C.P.U, Stack organization,Instruction format, Addressing modes, Parallel processing, Pipelining, Arithmetic pipelining, Instruction pipeline, RISC pipeline, Vector processing, Array processor**.**

5. **Memory Organization:** Memory hierarchy, Types of memory, Associative memory, Virtual memory, Cachememory.

Readings:

1. M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

2. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5d., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.

3.R.P.jain, Modern Digital Electronics, 3ed., Tata McGraw-Hill publishing company limited ,New Delhi, 2003.

4. Carl Hamacher, ZvonkoVranesic and SafwatZaky, 5th Edition "Computer Organization", McGraw-Hill,2002.

5. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.

6. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002

MSC-201

Principles of Operating System

1. **Introduction**: Definition, Design Goals, Types, Batch processing, Multi-programming, Real time, Timesharing; Functions of Operating System.

2. **Process Management**: Process states, Process Control block, Schedulers, CPU Scheduling algorithms

3. **Inter process synchronization and communication:** need, Mutual exclusion, semaphore, classical problemsin concurrent programming, critical region and conditional critical region, Deadlock Characteristics, prevention, resource allocation graphs.

4. **Memory Management**: Address Binding, Dynamic Loading and Linking Concepts, Logical and PhysicalAddresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing,

5. **File and Secondary Storage Management**: File Attributes, File Types, File Access Methods, DirectoryStructure, File System Organization, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management.

UNIX/ LINUX/ WINDOWS/Android as an example of Operating systems

Readings:

1. Operating System Concepts 6/ed By Silberschatz and Galvin, Addison Wesley.
2. Operating Systems: Internals and Design Principles 5/ed By William Stalling, PHI.
3. Modern operating Systems By Tanenbaum, PHI.
4. Operating System Concepts By Peterson and Silberschatz, Addison Wesley.
5. Operating System Principles By P. B. Hansen, PHI.
6. The UNIX Operating System By K. Christian, John Wiley.

MSC-202

Object Oriented Programming with C++

1. **Principles of OOP:** Procedure oriented Vs Object oriented, OOP paradigm, Features of OOP ,Basic Data types Tokens, Keywords, Constant ,Variables, Operator I/O statements , Structure of C++ program, Arrays, pointers, Object modeling technique (OMT).

2. **Function, Object and Class:** Defining class, Abstract class ,Function prototype, Function with parameter ,Passing object as a parameter, Constructor function ,Types of constructor, Destructor Friend function , Friend class, Dynamic allocation operator new and delete.

3. **Polymorphism and Inheritance:** Types of polymorphism, Constructor overloading ,Operator overloading, Template function Template class, Types of inheritance ,Private ,protected and public derivation of class ,Resolving ambiguity Pointer to object, This pointer ,Virtual class , virtual function.

4. **Input - output and File handling:** I/O classes ,File and stream classes ,Opening and closing file Detecting end of file, String I/O**,** Char I/O, Object I/O, I/O with multiple object ,File pointer, Disk I/O**.**

5. **Exception handling, Name spaces and Standard Template library (STL):** Need of Exception handling ,try ,catch and throws keywords , defining namespace ,benefit of namespace, Component of STL.

Readings:

1. Object oriented programming with C++ by E.Balagurusamy II nd edition Tata Mc-Graw Hill.
2. Object Oriented ProgramminBy McGregor and Sykes S A, 1992 Van Nostrand.
3. The C++ Programming LanguageByStrustrpB,AddisionWasley.
4. Object Oriented Programming in C++ By Lafore R, Galgotia Publications.
5. Introduction to Object Oriented Programming By Witt KV, Galgotia Publications.
6. Object Oriented Programming ByBlaschek G, Springer Verlag

MSC-203

Theory of Computation

1. **Theory of Automata:** Definition of an automaton, Transition system, Acceptability of a string byFA, Nondeterministic finite state machine, Designing of DFA and NFA ,Equivalence of DFA and NFA, Conversion of NFA to DFA, Minimization of finite automata, Mealy and Moore models, Minimization of finite automata.

2. **Formal Languages, Regular Sets and Regular Grammars:** Definition, Languages and theirrelation, Chomsky classification of language, Regular expression, and Finite automaton, Pumping Lemma for regular sets, Application of Pumping lemma, Closure property of regular sets, Regular sets and regular grammar.

3. **Context-free Language**: Context fee language and derivation trees, Ambiguity in context freelanguages, Simplification of context free languages: (left recursion, Unit production elimination, Eliminating null values) Normal forms of context free languages.

4. **Pushdown Automation**: Definition, Acceptance by PDA, Designing PDA, Push down automationand Context free languages, Parsing and Pushdown automata.

5. **Turing Machine:** Turing Machines model, Representation of TM, Languages acceptability by TM,Design of TM, Introduction: Universal Turing Machines and Halting problem, Introduction: Linear bounded automata and languages.

Readings:

1. K L P Mishra “Theory of Computation”,3rd Edition PHI Publication.
2. J.E.Hopcroft, R.Motwani and J.D Ullman, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2003
3. G.PSaradhiVarma and B. ThirupathiRao , “ Theory and Computation FormalLanguages and Automata Theory”,2005, SCITECH publication.
4. H.R.Lewis and C.H.Papadimitriou, “Elements of The theory of Computation”,Second Edition, Pearson Education/PHI, 2003
5. J.Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, TMH, 2003.

MSC-204

ELECTIVE-I (1)

Computer Networks

1. **Introduction and Physical Layer :Introduction:** Goal and application Network Hardware and Software, Protocol Hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Model ,Types of computer Network :LAN,MAN,WAN, Topologies, Transmission mode .

   Physical Layer :Data and signal, Analog and digital Communication, Transmission Media ,Concept of datatransmission, Switching Techniques ,Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM.

2. **Data Link Layer :**Data Link Layer design issues Data link control:Framing, Flow control. ErrorDetection and Correction. DLC protocol :Stop and Wait Protocol, Sliding window protocol, A Simplex protocol for noisy channel, Medium access sublayer: Channel allocation :static and dynamic ,Multiple access protocol FDDI, Data Link Layer in the Internet : SLIP,PPP. Wired and Wireless LAN protocol.

3. **Network Layer :** The Network Layer Design Issue, IP addressing, Address mapping, Error reporting ,Multicasting ,Delivery, Forwarding and Routing.

   The Network Layer in the Internet: The IP Protocol. subnets, Internet control protocols, Internet multicasting.

4. **Transport Layer :**The Transport layer services, The socket addressing Quality of service, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP

segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP.

5. **Presentation and Application Layer** : Network Security, Traditional Cryptography, Private key cryptography and public key cryptography, Authentication protocols, DNS ,SNMP,E-mail, application layer protocols.

Readings:

1. Data Communications and Networking By Forouzan, Tata McGraw Hill Company.
2. Computer Networks By A.S. Tanenbaum
3. Computer Network By S.S.Shinde ,New Age International Publisher.
4. Data and computer Communication by Shashi banzal ,Firewall media
5. Internetworking with TCP/IP :Principles,protocols,and Architecture Vol 1 5th Edition ,PHI publication
6. Data Communications and Computer Network by Prakash C Gupta, PHI Publication.

MSC-204

ELECTIVE-I (2)

System Analysis and Design

1. System definition, Need for system development, Types of system, Types of user, System development strategies, SDLC, Feasibility study, Structured Analysis, Development Strategies, Physical and Logical DFD, Data Dictionary, System Prototype Method, Role of system analyst, System investigation:- Fact Finding Techniques, Tools for Documenting Procedure & Decision :Decision Tree, Decision Table, Structured English. Academic and personal qualification of a system analyst, the multifaceted role of the system analyst.

2. Cost benefit analysis: cost and benefits determination. The system proposal. File structure, file organization: sequential organization, indexed sequential organization, inverted list organization. Direct access organization. Database design: Objectives of database and role of database administrator.

3. Introduction to UML, OO Development Life cycle and Modelling, static and Dynamic modelling, Comparison of OO and Module-Oriented Approach, Modelling using UML.

4. System Implementation (System Testing & Quality Assurance) - Introduction, the Test Plan, Quality Assurance, Levels of Quality Assurance, Role of Data Processing Auditor.

5. Software Documentation- Requirement Documentation, Architecture/Design Documentation, Technical Documentation, User Documentation, Marketing Documentation, Documentation Standard, Online Documentation

Readings:

1. Edward," System Analysis & Design ", Tata McGraw Hill, ISBN:8120317270
2. James, A.S, Analysis and design of information systems, Mc Graw hill, New York, 1997
3. 'A' Level *made simple* Structured System Analysis and Design, BPB publications: Dr.Madhulika Jain, Vineeta Pillai, Shashi Singh, Satish Jain
4. Effective Methods for Software Testing, William E. Perry
5. Venkata Rao,v., System Analysis, design & MIS,BPB publications, 2000
6. Awad, Elias., analysis and design, Galgotia publications pvt.Ltd.1998

MSC-204

ELECTIVE-I (3)

Introduction to Microprocessor

1. Introduction, Overview of microcomputer systems, General operation of a microcomputer, Microprocessor : their emergence from 8-bit, Decoder, encoders, Latches, Flipflops, Multiplexer, Demultiplexer.

2. Microprocessor History, 8085 Architecture and Register organization, Functional Block Diagram, Bus Organization, 8085 Instruction Set, Instruction classifications, Instruction word size, Instruction format, Addressing modes, Assembly Language programming,

3. Memory, I/O devices, Addressing memory and I/O devices, Memory mapping, Memory Interfacing, TriState Devices, Buffers.

4. Programming techniques with additional instructions: Looping, Counting, Indexing, Introduction to Advanced Instructions, Instruction cycle, Machine cycle, Timing Diagram, Stack and subroutine, Counter and Time delay, Debugging.

5. Interfacing Chips: 8255A (PPI), 8155 (Multipurpose Programmable Device), Interrupts, 8259A (PIC), Serial I/O and Data communication, Serial Data communication standard (RS 232C) 8257 or 8237A (DMA Controller), 8251A (USART). 16 bit processor 8086: Introduction, Architecture, Pin Diagram, Min & Max Mode, Addressing Modes.

Readings:

1. .Ramesh S. Gaonkar, ―Microprocessor Architecture, Programming and Application with 8085‖, 5th edition, Penram International Publishing (India) Pvt. Ltd.
2. .D V Hall, ―Microprocessor & Interfacing‖ McGraw Hill Education India
3. A. P. Mathur , ―Introduction to Microprocessor‖ McGraw Hill Education India.
4. B.Ram, ―Fundamentals of Microprocessor and Microcomputer‖ DhanpatRai& Co Publication.
5. P K Ghosh, P R Sridhar, ―0000 to 8085 Introduction to microprocessor to Engineers &Scientists‖Prentice-Hall of India.

MSC-205

ELECTIVE-II (1)

Object Oriented Software Engineering

1. **Software Engineering Paradigms:** Software Development process models.
   Project & Process: Project management, Process & Project metrics.
   Fundamental concepts of object oriented programming: Introduction to the principles of object-oriented programming (classes, objects, messages, encapsulation, inheritance, polymorphism, exception handling, and object-oriented containers).
   Object Oriented Analysis: Object Oriented Analysis,
   Analysis Techniques: Object Modeling, Dynamic Modeling, and Functional Modeling. Adding Operations, Analysis Iteration.

2. **Using UML**: UML Introduction. **Object Modeling Notations**: Basic Concepts. **Structural Diagram:** Class Diagram, Object Diagram, Component Diagram, Deployment Diagram. **Behavioral Diagrams:** Use Case Diagram, Interaction Diagram, Activity Diagram, Statechart Diagram. **Modeling with Objects. System Design, Object Design.**

3. **Object Modeling**: Objectives. **Advanced Modeling Concepts:** Aggregation, Abstract Class, Multiple Inheritance, Generalization and Specialisation, Meta Data and Keys, Integrity Constraints, **Dynamic Model:** Objectives, Events, State and State Diagram, Elements of a State Diagram, Advanced Concepts in Dynamic Modeling, **Functional modeling.**

4. **Patterns:** Benefits of patterns, using patterns during Analysis, using Pattern during Design.

5. **Object mapping with Database:** Objectives, Relational Database Schema for Object Modes, Object Classes to Database Tables, Mapping Associations to Tables, Mapping Generalizations to Tables, Interfacing to Databases.

Readings:

1. Bernd Bruegge& Allen H. Dutoit, “Object-Oriented Software Engineering”, 2009.
2. Bertrand Meyer, Object Oriented Software Construction, Prentice-Hall.
3. Grady Booch, James Rumbaugh and Ivar Jacobson, Unified Modeling Language Guide,Addison-Wesley.
4. Ivar Jacobson, “Object-Oriented Software Engineering”, Pearson Education, 2009.
5. Stephen R. Schach, “Object-Oriented Classical Software Engineering”, Mc Graw Hill, 2010.
6.Yogesh Singh, “Object-Oriented Software Engineering”, 2012
7.Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005

MSC-205

ELECTIVE-II (2)

Multimedia

1. Introduction to Multimedia System Multimedia elements, Multimedia applications, Global structure, Technologies for Multimedia system. Multimedia: Media & Data Streams Multimedia: media & data streams, Properties, Traditional data stream characteristics, Data stream characteristics for continuous media, Information units.

2. Sound / Audio Sound Concepts, Music: MDI Concepts, MIDI devices, MIDI messages, MIDI software, Speech: Speech generation, Speech Analysis, Speech Transmission. Image And Graphics Digital Image Representation, Image Formats, Graphics Formats, Image Processing: Image Synthesis, Image Analysis, Image Transmission.

3. Video & Animation Basic concepts, Television (Conventional systems, Enhanced definition systems, High Definition system), Computer based Animation.

4. Data Compression Storage space, Coding requirements, Source Entropy & Hybrid coding, Basic compression techniques, Introduction to following compression techniques: JPEG, H.261 (PX64), MPEG ,DVI

5. Optical Storage Media & Retrieval Technologies Basic Technology, Video Disk & other WORMS, CD ROM, CD ROM Extended Architecture, Compact Disk Magneto optical.

Readings:

1. Multimedia System Design By P. K. Andleigh, Kiran Thakrar.
2. Multimedia Computing Communication & Application. By Ralf Steinmetz, &Klaranashtedt. (Pearson Education).

MSC-205

ELECTIVE-II (3)

Linux operating System and Shell Programmming

1. **INTRODUCTION TO LINUX:** History, The Linux Architecture, Features of Linux, Internal and External Commands, Command Structure, difference between Linux and Unix, various Linux distributions, basic commands.

   UTILITIES: file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text processing utilities and backup utilities, Security commands. The vi editor, securityby file Permissions.

2. **INTRODUCTION TO SHELLS:** Session, Standard Streams, Redirection, Pipes, Tee Command,Command Execution, Command-Line Editing, Quotes, CommandSubstitution, Job Control, Aliases, Variables, Predefined Variables, Options,Shell Edition Environment Customization. Filters.

   GREP: Operation, grep Family, Searching for File Content.

   SED: Scripts, Operation, Addresses, commands, Applications.

   AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications.

3. **INTERACTIVE KORN SHELL:** Korn Shell Features, Two Special Files, Variables, Output, Input, ExitStatus of a Command, eval Command, Environmental Variables, Options,Startup Scripts, Command History, Command Execution Process.

   KORN SHELL PROGRAMMING: Basic Script concepts, Expressions, Decisions Making Selections,Repetition, special Parameters and Variables, changing PositionalParameters, Argument Validation, Debugging Scripts, Script Examples.

4. **INTERACTIVE C SHELL:** C shell features, Two Special Files, Variables, Output, Input, Exit Statusof a Command, eval Command, Environmental Variables, On-OffVariables, Startup and Shutdown Scripts, Command History, CommandExecution Scripts.

   C SHELL PROGRAMMING: Basic Script concepts, Expressions, Decisions: Making Selections,Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

5. **FILE MANAGEMENT:** File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

Readings:

1. Sumitabha Das, "Unix Concepts and Applications", 4thEdition. TMH, 2006. (1, 2 units)
2. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming",1stEdition,Cengage Learning India, 2003.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.
4. Graham Glass, King Ables, "Unix for programmers and users", 3rd Edition, Pearson Education, 2009.
6. N.B Venkateswarlu, "Advanced Unix programming", 2ndEdition, BS Publications, 2010.
7. YashwanthKanitkar," Unix Shell programming", 1stEdition, BPB Publisher, 2010.
8. Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill

MSC-301

Probability and Statistics

1. **Descriptive measures** : Frequency distribution, mean, median, mode, standard deviation, moments, skewness and kurtosis,
   Probability: Definitions of Probability, Addition Theorem, Conditional Probability, Multiplication Theorem, Bayes' Theorem of Probability.

2. **Random Variables and their Properties:** Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions Their Properties, Transformation Variables, Mathematical Expectations, Covariance.

3. **Probability Distributions:** Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and their Properties; Continuous Distributions : Uniform, Normal, Exponential Distributions and their Properties.

4. **Multivariate Analysis and Curve Fitting**: Correlation, Correlation Coefficient, Rank Correlation, Linear Regression, Multiple Regression, Principles of Least Squares and Curve Fitting

5. **Estimation and testing of hypothesis**: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-Biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation. Small Sample Tests. Large Sample Tests.

Readings:

1. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2002
2. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
3. Probability, Statistics and Random Processes, T.Veerarajan Tata McGraw – Hill
4. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

MSC -302

Artificial Intelligence

1. **Introduction:** Definitions and approaches, Foundation of A.I. , Challenges in AI, Area andApplications of A.I., Intelligent Agents: meaning, types, environments, examples.

2. **Problem Solving:** Problem solving as state space search, production system, writing production system andsolution for a Water jug problem; some AI classical problems (statements only) cannibal missionaries, tower of Hanoi, tic tac toe, 8-puzzle, Search techniques: Breadth First, and Depth-first, Best-First Search, Hill-climbing, Heuristics, A* algorithm, local and global maxima(minima).

3. **Knowledge Representation and Reasoning**: Predicate and prepositional logic, conversion ofsentences to wffs of predicate logic, Resolution, clause form, Skolem functions, Unification, Resolution in Propositional and predicate logic, Semantic Nets.

4. **Pattern Recognition:** Meaning of pattern, Pattern Recognition, Classification, Supervised &UnsupervisedLearning of classifiers, K-NN, K-MEANS algorithms.

5. **Expert Systems:** Introduction, Advantages, components and participants in an expert system, Application

Readings:

1. Artificial Intelligence: E. Rich and K. Knight, Tata McGraw Hill.
2. Artificial Intelligence: A New Synthesis By Nilsson, Morgan Kaufmann.
3. Pattern Classification 2nd Edition By R.O.Duda, Hart, Stork (2001) ,John wiley, New York.
4. Pattern Recognition : Technique and Applications By Shinghal (2006) ,Oxford University Press,New Delhi.

MSC – 303

Relational Data Base Management System

1. **Overview of Database Management** :Data, Information and knowledge, Increasing use of data as acorporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases.

2. **Relational Model :**Entity - Relationship model as a tool for conceptual design-entities attributesand relationships. ER diagrams; Concept of keys: candidate key, primary key, alternate key, foreign key; Strong and weak entities, Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features.

3. **Structured Query Language :**Relational Algebra: select, project, cross product different types of joins(inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages, Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.

4. **Relational Database Design :**Normalization concept in logical model; Pitfalls in database design,update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of indexes, File organization for relational tables, De-normalization.

5. **Introduction to Query Processing and Protecting the Database & Data Organizations :** Parsing,translation, optimization, evaluation and overview of Query Processing. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Triggers, Security & Authorization in SQL.

Readings:

1. Database system concept By H.Korth and A. Silberschatz, TMH.
2. Data Base Management System ByAlexies&Mathews, Vikas publication.
3. Data Base Management System By C. J. Date, Narosha Pub.
4. Data Base Management System By James Matin.
5. Principles of Database System By Ullman.
6. An Introduction to database systems By Bipin Desai, 2011 ed., Galgotia Publication.
7. Database Management System By A. K. Majumdar &P. Bhattacharya, TMH

MSC-304

ELECTIVE-III (1)

Advanced Java Programming

1. **Basics of Core JAVA:** class, interface, exception handling.Collections : Collection Interfaces, Concrete Collections,The Collections Framework

2. **Multithreading :** Creating thread and running it, Multiple Thread acting on singleobject,Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread

3. **Networking:**Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams.
   Java Database Connectivity (JDBC):
   Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.

4. **Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle,HandlingHTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession.

5. **Java Server Pages (JSP):** Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries, Enterprise Java Bean: Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties,Types of beans, Stateful Session bean, Stateless Session bean, Entity bean

6. **Remote Method Invocation:**

   Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client, Struts: Basics of Struts,Struts : What and Why? ,Model1 vs Model2 ,Struts2 Features,Steps to create Struts application ,Understanding Action class ,Understanding struts.xml file

Readings:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" by Antonio Goncalves – Apress publication

MSC-304

ELECTIVE-II (2)

System Software

1. **Basic Concepts:** Software, System Software, Types of system software, SIC (Simplified Instructional Computer), SIC/XE, Simple programs for SIC and SIC/XE

.

2. **Assemblers:** Assembler functions, M/C dependent assembler features, M/C independent assembler features, One-pass assembler, Multi-pass assembler, Implementation example-MASM assembler.

3. **Loaders and Linkers:** Introduction, Basic loader function, Machine dependent loader features, machine independent loader features, Loader design option.

4. **Macro processors:** Macro definition and expansion, Macro processor algorithm and data structure, Independent macro processor features, Macro processor design option.

5. **System software tools:** Software tools for program development, Editors, Debugging, Programming environment, User Interface.

Readings:

1. Leland L. Beck, System software-An Introduction to System Programming, 3rd Edition,PearsonEducation, Asia, 2006.
2. D. M. Dhamdhere, System Programming & Operating Systems, Tata Mc Graw Hill, Second RevisedEdition, 1999.

3. J. Donovan, Systems Programming: An Introduction to System Programming, Tata Mc Graw Hill Publication,Edition, 1999.
4. A. C. Shalini, System Software, Scitech Publications (INDIA) PVT, LTD, Fifth Reprint, 2010.

MSC-304

ELECTIVE-III (3)

Neural Network

1. **Introduction:** What is a neural network, benefits, model of a simple neuron, various components and their meaning used in the simple model of an artificial neuron

2. **Models of Neural Networks:** Single layer, multi layerperceptrons, types of transfer functions, recurrent networks , calculation of output in forward propagation in these networks, linearity and nonlinearity in models,

3. **Supervised and Back Propagation Networks:** Meaning of supervised learning with examples, Learning rules, errors and their calculations, learning in a neural network, training and testing of a neural network in prediction for single layer only, local mimima, momentum, over-fitting in neural networks

4. **Unsupervised learning:** Meaning of supervised learning with examples and applications, learning with a teacher, Self Organized Feature Maps (SOFM), Kohonen Network learning and their examples

5. **Applications**: Neural Networks and their applications in classification, prediction, identification

Readings:

1. Neural Networks: A Comprehensive Foundation: Simon Haykin, Prentice Hall [2001 or later]
2. Neural Network Design: Hagan, Demuth, Beale, Thomson Learning, [2001 or later]
3. Introduction to Neural Networks Using MATLAB 6.0: Sivanadam, Sumathi, Deepa, The McGraw Hill [2006 or later]

MSC-305

ELECTIVE-IV (1)

Web Technology

1 **Internet Concept**: Fundamental of Web ,History of Web, Web development overview, Domain NameSystem (DNS),DHCP,and SMTP and other servers ,Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture ,Web Browser and Web Server.

2. **HTML and DHTML:-**HTML Tag, Rules of HTML, Text Formatting and Style, List, AddingGraphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML, Introduction to DHTML, CSS, Class and DIV, External Style Sheet.

3. **Scripting Languages:** Java Script (JS) in Web Page, Advantage of Java Script, JS object model and hierarchy ,Handling event, Operators and syntax of JS, JS Function, Client side JS Vs Server side JS ,JS security, Introduction to VB Script, Operator and Syntax of VB Script, Dialog Boxes, Control and Loop, Function in VBS.

4. **XML:**Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitiveadvantage with XML, Programming in XML, XML Schema ,XSLT ,DOM structure model ,XML quires and transformation.

5. **Active Server Page (ASP):** Introduction ,Internet Information System (IIS),ASP object ,Server object,File system object, session ,Accessing data base with an ASP page ,ODBC – ADO connection object, common methods and properties, ADO record set object .Introduction to ASP.Net.

Readings:

1. The complete Reference By Thomos A. Powell ,TMH publication
2. Web Technology :A Developers Perspective ,N.P.Gopalan ,J.Akilandeswani,PHI Publication.

3. Java Script :The definite Guide By Flangam , O'Reilly
4. Java Script :Developers Resource by Kamran Husain and Jason Levitt PTR-PHIpublication.
5.Mastering VB Script" BPB Publication.
6.World Wide Web design with HTML by Xavier Tata McGraw Hill Publication .
7. XML By Example, Sean Mc Grath Pentice Hall Publication.
8. Web Technology : A Developments Perspective , N.P. Gopalan, J. Akilandeswari, PHI Publication

MSC -305

ELECTIVE –IV (2)

Pattern Recognition

1. **Pattern Concept:** Meaning of pattern, examples of patterns, importance of study of patterns in machine learning, meaning of labels, attributes, features, dimensions in patters with examples, pattern recognition and classification, meaning of machine learning

2. **Pattern Recognition and classification:** Meaning and importance in machine learning, supervised and unsupervised learning with meaning and examples, classifiers, k-nnclassification and k-means clustering, implementation and applications

3. **Decision Trees:** Meaning of tree and hence decision tree, building a decision tree, decision tree induction, classification using a decision tree, classification using ID3

4. **Evolutionary Computing:** Meaning of evolutionary computing, various operators used in evolutionary computing, genetic algorithms and their applications, Particle Swarm Optimization and their applications, Multi-objective Genetic Algorithms with examples

5. **Ensemble of classifiers:** Meaning and importance of ensembles, boosting and AdaBoost algorithm, bagging and random forest, weak and strong learning, ensembles of classifiers with voting.

Readings:

1. Pattern Classification: Duda, R.O, Peter Hart, David Stork, 2010, Wiley India
2. Data Mining: Concept and Techniques, Morgan and Kaufmann, 2001

3. Pattern Recognition: RajjanShinghal, Oxford University Press New Delhi, 2006
4. Ensemble Methods, Foundations and Algorithms, Zhi-Hua Zhou, A CRC Press, Chapman and Hall Book, 2010
5. Pattern Recognition, RobiPolikar, Wiley Encyclopedia of Biomedical Engineering, 2006 John Wiley & Sons, Inc

MSC-305

ELECTIVE-IV (3)

Compiler Design

1. **Basics of Compilers and Lexical Analysis:** Compilers and Translators, Bootstrap compiler, Phases ofCompiler, Compiler writing tools, Bootstrapping, Overview of one pass compiler, Finite Automation, Basics of DFA, NFA, Regular sets and Regular expressions.

2. **Syntax analysis & Parsing techniques:** Basics of context free grammars and derivation of parse trees, Topdown parsing and its implementation, Operator precedence parsing, Predicative top down parser, Bottom up parsing, Handel of right sentential form, LR parser, Canonical collection of sets, Construction of parsing action and GOTO table, Construction of LALR parsing table, Handling ambiguous grammar.

3. **Syntax directed definition and Translation**: L-attributed definition, Syntax directed translation scheme,Intermediate code generation**,**Representing three address statements, Syntax directed translation scheme to specify the translation of various programming language construct, Implementing increment and decrement operators, Array reference, Switch/case.

4. **Symbol table management & Error Handling**: Various approaches to symbol table organization,Representation of scope information in symbol table, Storage allocation activation of procedure and record, Static allocation and stack allocation. Error recovery, Error recovery in LR parsing, Predicative parsing error recovery.

5. **Code Optimization and Code Generation:** Introduction, Loop optimization, Eliminating inductionvariable, Eliminating local common sub expression, DAG, Eliminating global common sub expression, loop unrolling, loop jamming, Problems hindering code generation, Straight forward code generation, Using DAG for code generation, Peephole optimization.

Readings:

1.Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman. "Compilers Principles, Techniques and Tools". Pearson Education,2008.

2.O.G.Kakde, "Compiler Design", 2005, Laxmi Publication.

3. AdeshK.Pandey "Concepts of Compiler Design", First Edition, S.K.Kataria& Sons Publication.

4.Steven S. Muchnick, "Advanced Compiler Design Implementation", Morgan Koffman,1997. 5.AllenHolub, "Compiler Design in C", Prentice Hall of India, 1990.

SYLLABUS B.Sc. (CS)

(The scheme and syllabi of any programme can be modified from time to time, students are advised to refer to University website for updates if any/ consult their respective teachers)

Department of Computer Science & Information technology
Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

SYLLABUS FOR UG/PG INTEGRATED (CS) COURSE UNDER *CHOICE BASED CREDIT SYSTEM*(CBCS)

Semester 1 **Session 2017-18 (On and after)**

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	PCSC-101	Fundamentals of Computers and Programming Methodology	2		20	30	2
2	PCSC-102	Introduction to Logics of Computer	2		20	30	2
3		Maths-I	3		30	45	3
4		Maths-II	3		30	45	3
5		Physics/Electronics - I	2		20	30	2
6		Physics/Electronics - II	2		20	30	2
7		Hindi	2		40	60	2
8		English	2		40	60	2
9	PCSC-103	Lab based on Computer Science		2	20	30	2
10		Lab based on Physics/Electronics		2	20	30	2
			18	4	260	390	22

Semester 2

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	PCSC-201	Introduction to Data Structures	2		20	30	2
2	PCSC-202	Computer Programming using C	2		20	30	2
3		Maths-I	3		30	45	3
4		Maths-II	3		30	45	3
5		Physics/Electronics - I	2		20	30	2
6		Physics/Electronics - II	2		20	30	2
7		Hindi	2		40	60	2
8		English	2		40	60	2
9	PCSC-203	Lab based on Computer Science		2	20	30	2
10		Lab based on Physics/Electronics		2	20	30	2
			18	4	260	390	22

Semester 3

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	PCSC-301	Computer Based Numerical Methods	2		20	30	2
2	PCSC-302	Database Management Systems	2		20	30	2
3		Maths-I	3		30	45	3
4		Maths-II	3		30	45	3
5		Physics/Electronics - I	2		20	30	2
6		Physics/Electronics - II	2		20	30	2
7		Environment - I	3		40	60	3
8	PCSC-303	Lab based on Computer Science		2	20	30	2
9		Lab based on Physics/Electronics		2	20	30	2
			17	4	220	330	21

Semester 4

Sno	Subject Code	Title	Credit		Marks		Total Credits
			L	P	Internal	External	
1	PCSC-401	System Analysis and Design	2		20	30	2
2	PCSC-402	Introduction to Computer Networks	2		20	30	2
3		Maths-I	3		30	45	3
4		Maths-II	3		30	45	3
5		Physics/Electronics – I	2		20	30	2
6		Physics/Electronics – II	2		20	30	2
7		Environment – I	3		40	60	3
9	PCSC-403	Lab based on Computer Science		2	20	30	2
10		Lab based on Physics/Electronics		2	20	30	2
			17	4	220	330	21

Semester 5

Sno	Subject Code	Title	Credit		Marks		Remarks
			L	P	Internal	External	
1	PCSC -501	Introduction to OOPS (C++)	4		20	30	4
2	PCSC-502	Introduction to Operating Systems	4		20	30	4
3	PCSC-503	Internet Applications	4		20	30	4
4	PCSC-504	Introduction to Software Engineering	4		20	30	4
5	PCSC-505	Minor Project		4		100	4
		Total	16	4	80	220	20

Semester 6

Sno	Subject Code	Title	Credit		Marks		Remarks
			L	P	Internal	External	

1	PCSC -601	Programming in Visual Basic	4		20	30	4
2	PCSC-602	Introduction to JAVA	4		20	30	4
3	PCSC-603	Linux Operating System and Shell Programming	4		20	30	4
4	PCSC-604	Introduction to Artificial Intelligence	4		20	30	4
5	PCSC-605	Major Project		4		100	4
		Total	16	4	80	220	20

Total Course Credits – 126

*** The syllabus is subjected to change as per the requirement.**

Subject – Fundamentals of Computers and Programming Methodology

Paper Code – PCSC-101

1. **Basics of computer –** Development of computer ,Computer system concepts, Characteristics, capabilities andlimitations of computer, Types and generation of computers, Computer architecture.

2. **Input /Output and storage device** – Basic input devices: keyboard, mouse, joystick, MICR, OCR. Light pen**,** Bar Code Reader, Touch screen, Basic output devices: Printer –Types of printer, Plotter, Monitor VGA, SVGA, XGA etc. Storage device: Different types of storage device, Primary VsSecondary data storage.

3. **Computer software** – Definition ,Software and its need ,types of software :Application software, Systemsoftware, Firmware, Evolution of programming language ,Different types of programming language :High level ,Assembly level ,Low level and 4GL,their advantages and disadvantages , language translator: Compiler, Interpreter, Assembler, Booting process.

4. **Programming tools:** Algorithm, Characteristics of algorithm, Program flow Charts, Pseudo code, Decision tables, and Structured programming techniques.

5. **Basic concepts of any programming language:** Character set, keywords, identifiers, assigning values of variables, Decision making and looping: recursion, switch ....break, repeat, labels and goto statements, types of operators in C Language, JAVA (Basic Principles, class, object), C++ etc.

Readings:

1. Alexis Leon and Mathews Leon, Fundamental o f Information Technology, Vikas Publication.

2. V.Rajaraman .Computer fundamental, PHI publication.

Subject – Introduction to logics of computer

Paper Code – PCSC-102

1. **Number Systems and codes:** Decimal numbers, binary numbers, binary arithmetic, 1's and 2's complements,Octal numbers, hexadecimal numbers, inter-conversion of number system, Digital codes: Binary coded decimal (BCD) , Gray code, Excess-3 code, Format of ASCII code.
2. **Logic Gates:** Positive and negative logics, NOT gate, OR gate, AND gate, NAND gate, NOR gate, EX-ORand EX-NOR gates , Symbol , truth table, Circuit diagram using basic gates , universal property of NAND and NOR gates.

3. **Boolean Algebra:** Boolean operation, logic expressing, rules and laws of Boolean algebra, Demorgan'stheorems, simplification of Boolean expression using Boolean algebra techniques.
4. SOP and POS form of Boolean expressions, minterms, maxterms, and simplification of Boolean expression using Karnaugh map techniques (Up to 4 Variables), half adder, Full adder, Multiplexer.
5. Flip-Flops, Registers, Shift registers, Counters.

Readings:

1. Computer Fundamentals, Architecture & Organization By B.Ram, New Age International Publisher limited.
2. Computer Architecture & Organization by MorissManno, 3rd edit ion, Print ice Hall of India Pvt Ltd.
3. Digital Computer electronics: An Introduction to micro computers by Albert Malvino and Jerald Brown, Tata Mcgraw Hill.
4. Modern Digital Electronics, by R.P Jain, Tata Mcgraw Hill Publication, 3 rd Edit ion.

Subject- Introduction to Data Structures

PCSC – 201

1. **Introduction:** Basic terminology, Elementary data organization, Data structure, Data structure Operation andTypes, Order of an algorithm, Complexity of Algorithms.

2. **Array, Pointers and Records**: Basic Terminology, Linear and multi dimensional Array. Pointers: Array of pointers. Records: Record Structures.

3. **Linked list, Stacks, Queues:** Traversing a linked list, searching a linked list, Insertion into a linked List, Deletion from a Linked List. Stacks: operation on stack, Array Representation of Stack. Queues: Linear Queue, Circular Queue, operation on Queue,.

4. **Trees** : Definition of Trees: Types of Trees, Linear Tree, Binary Tree and Their Representation,Implementation and Searching (inorder, Preorder, Postorder), Operations on binary search tree: Traversing, Searching, Insertion, Deletion.

5. **Sorting and searching**: Sorting: bubble sort, quick sort, Insertion Sort, Selection Sort, Merge sort, heap sort.Searching: Binary Search, hashing.

Readings:

1. Data Structure - Seymour Lipschutz (Schaum's Series).
2. Data Structure & Program Design - Robert L. Kruse, 3rd Ed., Prentice Hall.
3. Standish, Data Structure, Addison-Wesley.
4. N. Wirth, Algorithms+Data Structures= Program, Prentice Hall.
5. Robert Lafore, Data Structures and Algorithms in Java, Sams.
6. Sahni S, data Structures, Algorithms and Applications in C++ , Mc Graw- Hill, 2002.
7. R. B. Patel and M.M.S. Rauthan, Expert Data Structures With C++, Khanna Publications, Delhi, India.
8. G. S. Baluja Data Structures Using C
9. A. M. Tennenbaum, Y. Langsam and M. J. Augenstein, Data Structures using C, PHI, 1996.

Subject –Computer Programming using C

Paper code – PCSC-202

1. **Origin & Introduction to C :**About C, Evolution of C, Structure of a C program,Compiling a C program, Simple C program, Character set in C, Keywords in C, Basic data types, Qualifiers used with basic data types, Variables in C, Type declaration, Input function, Output function and format specifiers, arithmetic operators, Unary operators, Relational and logical operators, address operator, conditional operator, Hierarchy o f operators.

2. **Decision Making, looping & Branching:** Control statements, if statement, if else statement, for statement, whileloop, do while loop, switch statement, break statement, continue statement, goto statement.

3. **Arrays & String Handling :**Introduction to arrays, advantages of arrays, single dimensional arrays,multidimensional arrays, array declaration, array initialization, accessing data from array, Character arrays, String Variables, Reading & writing strings, string handling functions.

4. **Pointers & User Defined Functions :**Introduction to pointers, pointer variables, pointers and arrays, pointers topointers, array of pointers, 2 dimensional arrays and pointers, Introduction to functions, advantages of functions, declaring a function, calling a function, passing arguments to a function.

5. **Structure, Union & File Management:** Declaring structure and union **File Management:** Defining & opening a file, closing a file, I/O operations on file.

Readings:

1. A. K. Saxena, Programming Language C : Anamaya Publishers, New Delhi.
2. Y. Kanetkar, Let Us C, BPB Publicat ion.

3. B.S. Gottfried, Schaum’s outline of Theory and Problems o f Programming with C, McGraw- Hill.

Subject – Computer Based Numerical Methods

Paper code – PCSC-301

1. **Algebraic Equation:** Bisection Method, Newton – Raphson Method, Regula Falsi Method.

2. **Simultaneous Algebraic Equation:** Gauss Elimination Method, Gauss-Jordan Method, Factorization Method,Jacobi's Iteration Method, Gauss- seidal Iteration Method.

3. **Matrix Inversion & Eigen Value:** Gauss Jordan Method, Factorization Method, Eigen values and EigenVectors.

4. **Interpolation:** Newton's backward and forward Interpolation Formula, Lagrange's Interpolation Formula.

5. **Numerical Differentiation & Integration:** Trapezoidal Rule, Simpson's one- third rule Simpson's three- eightrule.

Readings:

1. Numerical Methods in Engineering & Science By Dr. B.S.Grewal, Khanna Publishers, Seventh edition, 2005.
2. Introductory methods of numerical Analysis By S.S.Sastry, Phi Learning publication, Edition Fourth , 2009

Subject – Database Management Systems

Paper code – PCSC-302

1. **Introduction:** Purpose of Database System, Concept of database & its evaluation, Views of Data, Types ofDBMS, DBMS architecture, Data Independency, Data Models, Data Dictionary.

2. **E-R Model:** Basic Concept, Design Issues, Entity Sets, Attributes & its Types, E-R Diagram, Design of an E-R Database Schema, Keys.

3. **Normalization:** Purpose of Normalization, Functional Dependencies, 1 NF, 2 NF and 3 NF.

4. **SQL:** Introduction to SQL, DDL, DML & DCL statements, Basic Operations, Aggregate function, Modificationof Database, other SQL features.

5. **Relational Model:** Structure of Relational Model, The Relational algebra (Selection, Projection, Union,Intersection, Cartesian product, Join), Tuple relational calculus.

Readings:

1. Database system concepts By H.Korth and A. Silberschatz ,S.Sudarshan, TMH Publication , 2010.
2. An introduction to Database Systems by Bipin Desai, Galgotia Publications, 2003 edition.
3. An Introduction to Database Systems, C.J.Date, A.Kannan, S. Swamynathan, Pearson Publication, Eight edition, Database Management System C.J.Data

Subject –System Analysis and Design

Paper code – PCSC-401

1. **System Concepts:** What is system, Characteristics of system, Elements of a system, Computer based systemandit s Components, Types o f Systems: Open and Closed System, Transact ion Processing System, MIS, DSS etc.

2. **System Analysis & Requirement Analysis:** what is System Analysis, Ro le and Qualities o f System Analyst,System Development Life Cycle- Phases o f S DLC, Prototyping- Steps in Prototyping, Advantages and Disadvantages of prototyping, Requirement Investigation, Feasibility Study, Fact finding techniques.

3. **Analysis and Design Tools:** Flowcharts, Decision Trees, Decision Tables, Database/File Design, Data FlowDiagrams, E-R Diagrams.

4. **System testing :**System testing – Black Box Testing, White Box Testing, Unit Testing ,Integration Testing, Modular Testing.

5. **Implementation, Type of Implementation-** Fresh, Replacement and Modified, ImplementationMethods.

Readings:

1. Analys is and Design of Infor mat ion System: James A Senn
2. System Analysis and Design: Awad

Subject - Introduction to Computer Networks

Papercode-PCSC-402

1. **Introduction**: Goal and application, Network Hardware and Software, Connection oriented and connection less services, Types of computer Network: LAN, MAN, WAN, Topologies, Transmission mode.

2. **Reference Models** – The OSI Reference model, The TCP/IP Model, Function of the layers.

3. **Physical Layer**: Data and signal, Analog and digital Communication, Transmission Media Guided Media,
4. Unguided Media, Transmission Impairment, Switching Techniques, Multiplexing – FDM, WDM, TDM.

5. **Data Link Layer**: Data Link Layer design issues Data link control: Framing, Flow control. Error detection and correction. Protocol: Stop and Wait Protocol, Sliding window protocol, introduction to MAC.

6. **Network Layer :** The Network Layer Design Issue, IP addressing, Address mapping,Multicasting,subneting.

Readings:

1. Data Communications and Networking By Forouzan, Tata McGraw Hill Company.
2. Computer Networks By A.S. Tanenbaum
3. Computer Network By S.S.Shinde , New Age International Publisher.

Subject – Introduction to OOPs(C++)

Paper code – PCSC- 501

1. **Overview of Object Oriented:** Need of Object Oriented, Procedural Vs Object Oriented approach, Benefits, C++and other languages.

2. **Features of Object Oriented:** Class, Objects, Polymorphism, Inheritance, Message Passing, Abstraction,Encapsulation.

3. **Class and Object:** Definition, Construction of class, Creation of objects, Pointer to Object, Array of Object,Comparison of Class with Union & Structure.

4. **Polymorphism:** Type of Polymorphism, Methods Overloading, Operator overloading.

5. **Inheritance:** Types of Inheritance, Single Level, Multi Level, Multiple & Hybrid Inheritance, Advantage ofInheritance, Base Class & Derived Class, C++ & VB: Introduction, Basic Data Type, Writing Simple Program.

Readings:

1. Object Oriented Programming: E. Balaguru Swamy, Tata Mc. Graw Hill
2. Object Oriented Programming & C++: By R. Raja Raman
3. Visual C++ Programming: Yeshwant P. Kanitka

Subject – Introduction to Operating Systems

Paper code – PCSC-502

1. **Introduction to O.S**: Over view of OS , function and goal, characteristics of OS, Hardware Concept related toOS , CPU States, I/O channels , Memory Hierarchy, Types of OS – Multiprogramming, Times haring, Batch Processing , Multitasking, Real-time.

2. **Concepts of Process**: Operation on Process, Process states, Concurrent Processes, Process ControlBlock(PCB) and signals, Process scheduling, Process Hierarchy.

3. **Process synchronization and Communication**: Problem of concurrent processes, Critical section,Mutual Exclusion, Deadlock, Process of Deadlock, Interpocess synchronization, need for interprocess synchronization.

4. **Memory Organization and management**: Address Binding, Logical and Physical address,Fragmentation, Concept of Virtual memory, Swapping and Relocation.

Preliminary Study of WINDOWS/ Unix.

Readings:

1. Silberschatz and Galvin, Operating S ystem Concepts 6/ed, Addisio n Wesley.
2. William Stalling, Operating S ystems: Internals and Design Principles 5/ed, PHI.
3. Tanenbaum, Modern Operating S ystems, PHI.
4. Peterson and S ilberschatz, Operating S ystem Concepts, Addison Wesley

Subject – Internet Applications

Paper code – PCSC-503

1. **Basic of Internet:** Basic concept, History, Hardware & software requirement, Client server architecture model,IP Address and Domain Name System, Use of Web Browsers, Customizing the browser, Finding information on the Internet, Search Engines, and Basic Protocols: HTTP, FTP, Telnet etc.

2. **Working with Internet:** Uploading and Downloading Text and Images, Web Pages and Web sites, Downloadingsoftwares with the Browser, Installing, Downloading software , Advanced Software Downloading.

3. **Services of Internet:** E-mail, Outlook express, Eudora and Netscape Messenger, Advanced E-mail.Facilities, Newsgroups: Use and Advantages, Online and e-mail Gaming, Chatting, Videoconferencing,World Wide Web (WWW).

4. **HTML:** Benefit and drawbacks, Tables, Frames, Image and Form, Introduction to CGI scripting.

5. **Web Pages:** Developing Web page with HTML.

Readings:

1. How to do Everything with the Internet: Dennis Jones.
2. The Internet: Douglas E. Coiner, Prenlicc- Hall, India.
3. Internet & Intranet Engineering : Daniel Minoli, TataMcGraw-Hill.
4. Introduction to Data Communication &Networking : Forouzan.

Subject – Introduction to Software Engineering

Paper code – PCSC-504

1. **Software Engineering Fundamental:** Introduction, evolution of software Engineering, Software Life Cycle Models, Comparisons of all models, Metrics for Project Size Estimation: line of Code, Function Point .Project Cost Estimation Model COCOMO and its types.

2. **Requirement Analysis and Software Design:** SRS and its characteristics, Software designing approaches, Modular designing, coupling, cohesion. Interface designing: Basic Concepts and types,

3. **Coding and Testing:** Coding standards and guidelines, code review techniques, types of system Failure, objective and types of testing, testing activities.

4. **Software Reliability, Quality Management:** Software reliability and software Quality Assurance, Software reliability Metrics, ISO 9000 certification, SEI Capability Maturity Model(CMM) its level, focus and key process .

5. **Software Maintenance:** Types of maintenance, maintenance tools, maintenance activities,

Readings:

1. Software Engineering: A practitioner Approach, Pressman Rogers, TMGH
2. Fundamentals of Software Engineering, Rajib Mall, PHI
3. An Integrated approach of software Engineering, Pankaj Jalote, Narosa, New Delhi.
4. Software Engineering Demystified by Deepti Bhanot, Galgotiya Publication.

Subject – Programming with Visual Basic

Paper code – PCSC-601

1. **Introduction to visual Basic:** Event Driven Programming, Features of VB, Introduction to IDE, Introduction to VB Controls and their properties, methods, events, forms, MDI forms, modules. Overview of variables, Constants, data types, Declaring Scope, Operators. Interacting with the user: Msgbox function, Inputbox function, If...Then statements, Select case, Looping statements: do..While, for.. next, for each, exiting a loop, gotostatementArray,Working with controlarray

2. **Procedure and Functions:** types of function, library function, string handling functions, date and time function, creating user defined function & procedure, call by value and call by reference, concept of recursion.

3. **Working with Controls:** Types of control, ComboBox and ListBox, Option Button Status Bar, menu editor.

4. **Error Handling and File Handling:** Types of errors, error trapping tools: watch window, local window, immediate window, tracing program flow with call stack. type of file handling, Sequential file handling: reading, writing. Random access file: reading, writing.

5. **Data Access Using the ADO Data Control:** Basic concepts of relational database concepts, connection using the ADO Data control to RDBMS, visual data manager,introduction to SQL, Cursor locations and types of Recordset and different lock types.

Readings:

1. Introduction to VB Programming: By V. K Jain
2. Database Programming VB6 : By B.P.B. Publication
3. Gary Cornell - Visual Basic 6 from the Ground up - Tata McGraw Hill
4. Noel Jerke - Visual Basic 6 (The Complete Reference) - Tata McGraw Hill

Subject- Introduction to JAVA

Paper code – PCSC – 602

1. **Introduction: Genesis** of java, importance to the Internet, overview and features.
   Language Basics: Constants, Variables and Primitive Data types, Operators and Expression, Decision Making and Branching statement, Decision Making and Looping, Classes, Objects and Methods, Arrays, Strings and Vectors.

2. **Inheritance:** Definition, Types, Method overloading and Method Overriding, super and this keywords.
   Interfaces: Defining Interface, Extending Interfaces Implementing Interface.

3. **Packages**: Defining Packages, Java API Packages, Naming Conventions, Creating Packages, Accessing Packages, Adding class to Package,CLASS PATH.
   Exception handling: Exception Types, Try, Catch & finally Blocks, Throw and Throws keywords. Creating user defined Exception.

4. **Multithreaded Programming:** Thread Model, Creating Threads, Thread Priority , Thread Exception, Synchronization.
   Input/output: Basic Streams, Byte and Character Stream, predefined streams, reading and writing from console and files.

5. **Java Collection:** Introduction, Overview of Interfaces, Overview of Classes.
   Introduction to AWT: Window fundamentals, creating windowed programs working with graphics, Using AWT controls, Delegation event model, handling mouse and keyboard event

Readings:

1. Naughton P and schildt H. Java: The complete reference, Osborne Mcgra-Hill, Berkeley, USA, 1997.
2. Rodgers Cadenhead, Laura Lemay, Sams Teach Yourself Java 2 in 21 Days, Sams Publishing.
3. E. Balagurusamy, Programming with Java, Tata McGraw Hill.
4. Bruce Eckel, Thinking in Java, Pearson Education.
5. Peter Van Der Linden, Just Java 2, Sun Microsystems/Prentice Hall.
6. Simply JAVA :An Introduction to JAVA programming By James R. Levenick ,Firewall Media publication, New,Delhi
7. Java Programming - Khalid Mughal.
8. Core JAVA An Integrated Approach By Dr. R. Nageswara Rao dremtech Publication.

Subject – Linux Operating System and Shell Programming

Paper code – PCSC-603

1. **Introduction to Linux:** History, various distributions, File System and architecture of the Linux, features and advantages of Linux. Basic commands: PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar,gzip

2. **Utilities:**Vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text processing utilities and backup utilities, Security commands.

3. **Introduction to Shell:** Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, FILTERS: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

   GREP: Operation, grep Family, Searching for File Content.
   SED: Scripts, Operation, Addresses, commands, Applications, grep and sed.
   AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions.

4. **Shell and Shell Programming:** Types of Shell, Linux variables, Iteration, control and if statement, conditional executions, tests, Array, case statement, Strings and substrings, functions, local and global shell variable (export command).

Readings:

1. Unix and shell Programming, Behrouz A. Forouzan, Richard F. Gilberg. Thomson

2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
3. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson education.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH.
6. Unix Shell programming, YashwanthKanitkar, 1st Edition, BPB Publisher

Subject - Introduction to Artificial Intelligence

Paper Code – PCSC – 604

1. **Introduction**: Meaning, importance to make machines intelligent, challenges before AI, Different areas of A.I. Applications, exactness in AI solutions, meaning of natural language processing (NLP)

2. **Problems Solving in AI:** Understanding a problem, state space, state space search, production systems, some AI problems like Tic-Tac-Toe,8 puzzle, cannibals and missionary, solution of a water jug problem using production system.

3. **Search Techniques:** Meaning and importance, blind search and informative search techniques, depth first and breadth first search, algorithms, and examples, best first search with examples.

4. **Knowledge Representation:** Propositions and propositional logic, applications and examples, limitations, Predicate logic, converting from simple sentences to predicate, simple semantic net.

5. **LISP**: Simple statements and programs using LISP

Readings:

1. E. Rich and K. Knight, Artificial Intelligence, Tata McGraw Hill.
2. LISP Programming: Any online tutorial / Lecture No

MAJOR PROJECT

PCSC-605

GUIDELINES FOR PROJECT WORK (MCA / M.Sc. (CS) /B.Sc. (CS)

A project report has to be submitted as per the rules described. Some additional guidelines regarding the Project Report are:

Number of Copies:
The student should submit One hardbound copies of the Project Report & 1 RW/CD.

Acceptance / Rejection of Project Report:
The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.

Format of the Project Report:
The student must adhere strictly to the following format for the submission of the Project Report

a. Paper
The Report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The Report to be submitted to the University must be original and subsequent copies may be photocopied on any paper.

b. Typing
The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons.

c. Margins
The typing must be done in the following margins.
Left ----- 35mm, Right ----- 20mm
Top ----- 35mm, Bottom ----- 20mm

d. Binding
The Report shall be Rexene bound in black. Plastic and spiral bound Project Reports are not accepted.

e. Front Cover:
The front cover should contain the following details:
TOP : The title in block capitals of 6mm to 15mm letters.
CENTER : Full name in block capitals of 6mm to 10mm letters.
BOTTOM : Name of the University, year of submission- all in block capitals of 6mm to 10mm letters on separate lines with proper spacing and centering.

f. Blank Sheets

At the beginning and end of the report, two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

Abstract

Every report should have an Abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.

The report should contain the following:

Institute Certificate
Certificate from Company
Acknowledgments
Abstract
List of Figures
Tables
Nomenclature and Abbreviations

Contents of the Project Report

1. Company Profile (only for M.I.S. projects)
2. Introduction to the project
3. Scope of work.
4. Existing System and Need for System.
5. Operating Environment - Hardware and Software.
6. Proposed System.
6.1 Objectives to be fulfilled
6.2 User Requirements
6.3 Requirements Determination Techniques and Systems Analysis Methods Employed.
6.4 Prototyping.
6.5 System Features
-Design of Input
-Design of Output screens and reports
-Module specifications
-D.F.D.'s and ER's
-System flow charts
-Data Dictionary
-Structure charts
-Database /File layouts
-User Interfaces
-Coding system
-Design of Control Procedures
-Design of Exception Handling
7. Testing procedures and Implementation Phases
8. Acceptance Procedure
9. Post-Implementation Review
10. User Manual
Menu explanation
-User guide
-Expected problems/errors and their solutions
11. Problems encountered

12. Drawbacks and Limitations
13. Proposed Enhancements
14. Conclusions
15. Bibliography
Annexure:

-Sample documents (manual or computer generated)
-Source code listing in a separate file
-Output reports

List of Tables:

The Contents shall be followed by a 'List of Tables' indicating the table number, table title and the corresponding page number(s). The table number shall be in decimal point notation indicating the chapter number and the table number in that chapter.

NOTE: Any reference within the text shall be given by quoting relevant number.eg: 'Table5.2'

List of Figures:

The 'List of Figures, shall follow the 'List of Tables' indicating the figure numbers, figure titles and corresponding page number. The figure numbers shall be in decimal point notation.

Nomenclature and Abbreviations:

The 'Nomenclature and Abbreviations' shall follow the 'List of Figures' and contain the list of symbols and abbreviations and their long names used. The nomenclature should be given for ER's, DFD's, STRUCTURED CHARTS, and RUN CHARTS and for all other symbols in the techniques used. The nomenclature for every technique should appear on a separate sheet. As far as possible, accepted standard symbols shall be used.

Chapter Numbering:

The Chapters shall be numbered in Arabic numerals. Section and subsections of any chapters shall be in decimal notation. All chapters shall begin on a new page. The titles for the chapters and the title shall be properly centered at the top of the page and have three spaces between them.

Company Profile:

This chapter should highlight the company details. This would be chapter 1 and should include the mainstream activity of the company, the product line of the company and the details of the department where the student was working. This should not exceed two pages or 800 words.

N.B.: Only relevant for M.I.S. Projects.

Introduction:

The 'Introduction' shall highlight the purpose of project work It will also define the chapters to be followed in the Project Report.

Existing System and the Need for the System:

If there is some system already in use, then a brief detail of it must be included, to help the examiner understand the enhancements carried out by6 the student in the existing system. Based on this, the student should exemplify the need for the computerization should be given.

N.B.: Only where relevant.

Proposed System:

1. Objectives : clearly define the objective(s) of the system in a few lines.

2. User Requirements : State the requirements of the use in an unambiguous manner.

3. Requirements Determination Techniques and System Analysis Methods Employed:

Use the formal methods to describe the requirements of the use. Like Fact Finding Methods, Decision Analysis, Data Flow Analysis etc.

4. Prototyping : If the prototypes have been developed prior to the Detailed design, then give details of the prototype.

5. System Features:

5.1 Design of Input : Inputs, Data Dictionary, Screens.

5.2 Design of Output : Outputs, Reports etc.

5.3 Design of Control Procedures: Structured charts, Module Specifications, Run charts etc.

5.4 Design of Exception Handling: Error handling and recovery procedures. The choice of including topics in this chapter entirely depends on the student. The freedom given for this chapter is obvious.

Students will be working on various types of projects. A typical M.I.S. development project must include DFD's and structured charts etc. Thus, a student is allowed to employ the techniques of his/her own choice suitable to his/her work. However, there is a guideline that the student must employ the techniques taught during the MCA/MSC course.

SYLLABUS B.C.A

B.C.A. (Semester – I)

Proposed Curriculum & Syllabus – 2022

SEMESTER I							
Sl. No.	Course Code	Course Title	L	T	P	C	
1	AECC-1	English (CAUATA1)	2	0	0	2	
2	DSE-1	Foundation of Mathematics (Disc, Prob, St) (CAUATD1)	4	0	0	4	
3	C-1	Computer Organization (CAUATT1)	4	0	0	4	
4	C-2	Programming in C (CAUATT2)	4	0	0	4	**22**
5	C-3	Introduction to Operating Systems (CAUATT3)	4	0	0	4	
6	L_C-1	Lab: Programming in C (CAUALT2)	0	0	4	2	
7	L_C-2	Lab: Linux &Shell Programming (CAUALT3)	0	0	4	2	

SEMESTER II							
Sl. No.	Course Code	CourseTitle	L	T	P	C	
1	AECC-2	Environmental Studies (CAUBTA2)	2	0	0	2	
2	C-7	MOOC -1 / ADA/TOC/Introduction to Compiler(CAUBTT4)	3	0	0	3	
3	C-4	Introduction to Data Science (CAUBTT1)	4	0	0	4	
4	C-5	Programming In Java (CAUBTT2)	4	0	0	4	**23**
5	C-6	Data Structures (CAUBTT3)	4	0	0	4	
6	L_C-3	Lab: Programming in Java (CAUBLT2)	0	0	4	2	
7	L_C-4	Industrial Internship (CAUBEF1)	0	0	0	4	

SEMESTER III							
Sl. No.	**Course Code**	**CourseTitle**	**L**	**T**	**P**	**C**	
1	C-11	Introduction to AI (CAUCTT1)	4	0	0	4	
2	C-8	Relational Database Management Systems(CAUCTT2)	4	0	0	4	
3	C-9	Computer Networks (CAUCTT3)	4	0	0	4	
4	C-10	Programming in Python (CAUCTT4)	4	0	0	4	**24**
5	L_C-5	Lab: Programming in Python (CAUCTT4)	0	0	4	2	
6	L_C-6	Lab: RDBMS(MySQL/Oracle)(CAUCLT2)	0	0	4	2	
7	L_C-7	Project (Industrial Training for 2 weeks) (CAUCPF1)	0	0	0	4	

SEMESTER IV							
Sl. No.	**Course Code**	**CourseTitle**	**L**	**T**	**P**	**C**	
1	C-15	Web Technology (CAUDTT1)	4	0	0	4	
2	C-12	Data Mining MOOC-2 (CAUDTT2)	3	0	0	3	
3	C-13	IoT (CAUDTT3)	4	0	0	4	
4	C-14	Software Project Management (CAUDTT4)	4	0	0	4	**23**
5	L_C-8	Lab: Web Technology (CAUDLT1)	0	0	4	2	
6	L_C-9	Lab: IoT (CAUDLT3)	0	0	4	2	
7	L_C-10	Project (Industrial Training for 2 weeks) (CAUCPF1)	0	0	0	4	

SEMESTER V							
Sl. No.	**Course Code**	**CourseTitle**	**L**	**T**	**P**	**C**	
1	C-15	Big Data Analytics (CAUETT1)	4	0	0	4	**23**
2	C-16	Machine Learning (CAUETT2)	4	0	0	4	
3	C-17	Data Visualization MOOC-3 (CAUETT3)	3	0	0	3	
4	C-18	Network Security / Cyber Security and Cyber Law(CAUETT4)	4	0	0	4	
5	L_C-11	Lab: Big-Data Analytics (CAUELT1)	0	0	4	2	
6	L_C-12	Lab: Machine Learning (CAUELT2)	0	0	4	2	
7		Project (Industrial Training for 2 weeks) (CAUEPF1)	0	0	0	4	

SEMESTER VI							
Sl. No.	**Course Code**	**CourseTitle**	**L**	**T**	**P**	**C**	
1		Industrial Project / Dissertation (CAUFPF1)	0	0	0	25	**25**

TOTALCREDITS –140

AECC-1

English

1. **Introduction:** Theory of Communication, Types and modes of Communication.

2. **Language of Communication:** Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication.

3. **Speaking Skills:** Monologue Dialogue, Group Discussion, Effective Communication/ Mis-Communication Interview, Public Speech.

4. **Reading and Understanding:** Close Reading Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts.

5. **Writing Skills:** Documenting, Report Writing, Making Notes, Letter writing.

Readings:

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English* - Pearson, 2008.
3. *Language, Literature and Creativity* - Orient Blackswan, 2013.
4. *Language through Literature (forthcoming) ed.* Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr.Brati Biswas.

DSE-1

Foundation of Mathematics (Discrete Mathematics)

1. **Mathematical Logic:** Propositions, logical connectives, Truth values & Truth table, Tautologies & Contradictions, Tautological Implications, Algebra of proposition, Normal Forms, Predicate Calculus.

2. **Set Theory:** Sets, Subsets, Cardinality, Power sets, **Algebra of Sets**: Union, Intersection and Complement, Duality, De-Morgan's law, **Relations:** Cartesian Products, properties of relations, equivalence relation,**Functions:** Injection, Surjection, Bijection, Composition of functions, Recursion.

3. **Boolean Algebra:** Basic Definitions and Theorems, De-Morgan's Law, Simplification of Boolean expression by Algebraic method, Canonical forms and Karnaugh-Map, Logic Gates and Switching circuits.

4. **Graphs:** Simple Graph, directed graph, Degree of a Vertex, Types of Graphs, Sub Graphs and Isomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems. Graph Coloring, Representation of Graphs, Planar Graphs.

5. **Trees:** Introduction, Trees and their properties, Spanning Tree, Binary Tree, Tree Traversal, Matrices: Notation and Definition, Addition, Subtraction, Multiplication, Transpose.

Readings:

1. *A text book of Discrete Mathematics* By Swapan Kumar Sarkar (S. Chand & company Ltd.).
2. *Discrete Mathematical structure with Applications to computer science* By J.P Trembly & R.P. Manohar.
3. *Discrete Mathematics* By K.A Ross and C.R.B writht.
4. *Discrete Mathematics Structures* By Bernard Kohman& Robert C. Bushy.for computer science.
5. *Discrete Mathematics* By Seymour Lipschutz Mare Lipson. Tata McGraw-Hill Edition.

C-1

Computer Organization

1. **Number System:** Binary, Octal and Hexadecimal number system, Conversion from one number system to another, Binary arithmetic, Representing negative numbers, BCD codes, ASCII codes, EBCDIC codes, Excess three code, Gray code, Floating point representation, 1's complement and 2's compliment,Arithmetic representation of signed binary numbers, 9's complement and 10‟s compliment system.

2. **Logic Gates and Boolean Algebra:** Properties and Symbolic Representation Of NOT, AND,OR,NOR, NAND, EX-OR, EX–NOR GATES, NOR and NAND GATES as a universal gates, Laws and identities of Boolean algebra, De-Morgan's theorem, Use of Boolean algebra for simplification of logic expression, SOP and POS forms, Canonical forms, Maxterm, Minterm, Karnaugh map for 2,3,4 variable.

3. **Combinational and Sequential Circuits:** Multiplexer, De multiplexers, Decoders, Encoders, Half adder, Full adder, Half subtractor, Full subtractor, n-bit adder, Adder-subtractor, Flip flops, Registers, Counters.

4. **CPU Organization and Parallel Processing:** General register organization of C.P.U, Stack organization, Instruction format, Addressing modes, Parallel processing, Pipelining, Arithmetic pipelining, Instruction pipeline, RISC pipeline, Vector processing, Array processor.

5. **Memory Organization:** Memory hierarchy, Types of memory, Associative memory, Virtual memory, Cache memory.

Readings:

1. M. Morris Mano, *Digital Design, 3.ed.*, Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. R.P.jain, *Modern Digital Electronics, 3ed.*, Tata McGraw-Hill publishing company limited , New Delhi, 2003.
3. Carl Hamacher, ZvonkoVranesic and SafwatZaky, 5th Edition *"Computer Organization*", McGraw- Hill,2002.
4. William Stallings, *"Computer Organization and Architecture – Designing for Performance",6th Edition*, Pearson Education, 2003.

5. David A.Patterson and John L.Hennessy, *"Computer Organization and Design: The hardware / software interface", 2nd Edition*, Morgan Kaufmann, 2002.

C-2

Programming in C Course

1. **Fundamentals of C programming:** History and Importance of C, Structure of a C program, Character Set, Tokens, Keywords, Identifiers, Data Types, Variables, Constants, Storage Class Specifiers, Operators, type of operators, precedence and associativity of operators, expressions, Type Casting and Conversion, Console I/O functions.

2. **Control Statements and Functions:** branching: if, if-else, nested if, switch-case, jump statements: break, continue, goto, return, looping: for, while, do-while, nested loops, functions: library functions, user defined functions, function declaration, function definition, function call, local and global Variables, Call by value and Call by reference, Recursion, Command Line Argument.

3. **Arrays, Strings and User defined Data Types:** Introduction to Arrays, one dimensional array, multi-dimensional array, Passing Array to functions, Introduction to strings, string functions, passing string to function, Introduction to Structure and Union, Declaration and initialization of structure, nested structure, array of structure, self-referential structure, passing structure to function, typedef keyword, Introduction to Enumeration.

4. **Pointer and Dynamic Memory Allocation:** Introduction to pointers, pointer variable, pointer arithmetic, pointer to pointer, null and void pointer, pointer vs. array, array of pointer, passing pointer to functions, sizeof() operator, Introduction to Dynamic memory allocation: malloc(), calloc(), realloc(), fee() functions.

5. **File Handling in C:** Introduction to file handling, file pointer, file accessing functions, fopen, fclose, fputc, fgetc, fprintf, fscanf, fread, fwrite, beof, fflush, rewind, fseek, ferror, File handling through command line argument. Introduction to C preprocessor #include, #define, Conditional compilation directives: #if, #else, #elif, #endif, #ifndef etc.

Readings:

1. *Programming in C,*"Yashwant Kanetkar", BPB Publications,Tenth Edition.
2. *Programming with C,* "Venugopal", TMHOutlineSeries,Third Edition.
3. *The C Programming Language,*"Kemighamand Ritche [Prentice Hall]".
4. *Programming in C Language*, "Dr. Amit Saxena" Ananya Publication.
5. *Programming in C Language,*"Bala Gurusamy" Fourth Edition.

C-3

Introduction to Operating System

1. **Introduction:** Definition, Design Goals, Types of Operating System, Functions of Operating System. Process Management: Process states, Process Control block, Schedulers, CPU Scheduling algorithms.

2. **Inter process synchronization and communication:** need, Mutual exclusion, semaphore, critical region, Deadlock: Characteristics, prevention, resource allocation graphs.

3. **Memory Management:** Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Thrashing.

4. **File and Secondary Storage Management:** File Attributes, File Types, File Access Methods, File System Organization, Allocation Methods; Disk Structure, Logical and Physical View, Disk Scheduling, Formatting.

5. **Introduction to Linux & Shell Programming:** The Linux Architecture, various Linux distributions, Command Structure and common commands, The vi editor, File System, Introduction to Shells, Standard Streams, Redirection, Pipes, Quotes, Job Control, Variables, Filter, Regular Expression, GREP, SED, AWK, Introduction to Shell Scripting.

Readings:

1. *Operating System Concepts 6/ed* By Silberschatz and Galvin, Addison Wesley.
2. *Operating Systems: Internals and Design Principles 5/ed* By William Stalling, PHI.
3. *Modern operating Systems* By Tanenbaum, PHI.
4. *The UNIX Operating System*By K. Christian, John Wiley.
5. Behrouz A. Forouzan, Richard F. Gilbery, *"Unix and shell Programming", 1 st Edition,* Cengage Learning India, 2003.

BCA (semester II)

AECC – 2

Environmental Studies

Paper Code –AECC

Introduction to environmental studies, Multidisciplinary nature of environmental studies, Scope and Importance, Concept of sustainability and sustainable development. Ecosystems: Structure and function of ecosystem: Energy flow in an ecosystem: food chains, food webs and ecological succession. a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Natural Resources: Renewable and Non-renewable Resources, Land resources and land use change. Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining. Dam building impact on environment, forests, biodiversity and tribal populations. Water: Use and over exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs and case studies. Biodiversity and Comervation: Levels of biological diversity, genetic, species and ecosystem diversity. Biogeographic zones of India. Biodiversity patterns, global biodiversity, hot spots, India as a mega biodiversity nation Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife. man wildlife conflicts, biological invasions. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational values. Environmental Pollution: types, causes, effects and controls of air, water, soil and noise pollution. Nuclear hazards and human health risks Solid waste management: Control measures of urban and industrial wastes. Pollution case studies. Environmental Policies and Practices. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act. Air Prevention & Control of Pollution Act. Water Prevention and control of Pollution Act. Wildlife Protection Act. Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD), Nature reserves, tribal populations and rights, human wildlife conflicts in Indian context. Human Communities and the Environment, Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons and case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements: Chipko, silent valley, Bishnois of Rajasthan. Environmental ethics: role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, cave and studies (eg., CNG vehicles in Delhi). Field work: Visit to an area to document environmental assets: river! forest flora/launa, etc. Visit to a local polluted site- Urban Rural/Industrial Agricultural. Study of common plants, insects, birds and basic principles of identification, Study of simple ecosystems-pond, river etc.

Readings:

1. Gleick, P. H, 1993, *Water in Crisis*, Pacific Institute for Studies in Dev., Environment &Security. Stockholm Env. Institute, Oxford Univ, Press.
2. Grumbine,R. Edward, and Pandit, M.K.2013. *Threats from India's Himalaya dams.* Science 339: 36---37.
3. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development.* OUP,

C-4

Introduction to Data Science

1. **Introduction to Data Science:** Definition, benefits and uses of data science and big data.**Facets of Data:** Structured data, unstructured data, natural language, machine generated data, network data, audio, images and video streaming data. **Data science process:** overview of data science process, defining the goal, retrieving data, data preparation, data exploration, build the models, cleaning and transforming data, presentation and automation.

2. **DATA:** Definition, characteristics of data, classification of digital data. **The Data Science Fundamentals:** Distributed file system, data integration frame work, machine learning framework, system deployment, security. **Data Mining:** definition, languages for data science, collection data –hunting, logging, scraping, cleaning data – error vs. artifacts, data compatibility, dealing with missing values, outlier detection.

3. **BIG DATA:** Definition, Evolution of big data and its importance, four V's in big data, Drivers for Big data, Big data analytics, Big data applications, designing data architecture, Big data vs Little data.

4. **Machine Learning:** Definition, Applications of machine learning in data science, Types of Machine Learning (Degree) - supervised learning, semi supervised learning, un-supervised learning, Linear regression, Decision Tree classifier – constructing decision Tree, Bayes - Naive Bayes.

5. **Data Visualization:** Definition, importance of data visualization in data science, Exploratory Data analysis - confronting new data set, visualization tools, developing a visualization aesthetic – maximizing data link ratio, proper scaling and labeling, effective use of color and shading, the power of repetition. **Chart Types:** Tabular data, dot and line plots, scatter plots, bar plots and pie charts.

Readings:

1. *Introducing Data Science* by Davy Cielen , Arno D.B.Meysman and Mohamed Ali, Published by Manning
2. Steven S.Skiena, *The Data Science Design Manual*, Published by Springer. Nature.
3. Cathy O'Neil and Rachel Schutt. *Doing Data Science*, Straight Talk from The Frontline.O'Reilly.

4. Jure Leskovek, AnandRajaraman and Jeffrey D. Ullman, *Mining of Massive Datasets. v2.1*, Cambridge University Press.

C-5

Programming in Java

1. **Introduction to Java:** Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators Doing Basic Program Output, Decision Making Constructs (conditional statements and loops).

2. **Arrays, Strings and I/O:** Creating & Using Arrays (One Dimension and Multi-dimensional), **Java Strings:** The Java String class, Collection in Java.

3. **Object-Oriented Programming:** Overview, Principles of Object-Oriented Programming, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes. Inheritance: Single Level and Multilevel, Method Overriding.

4. **Abstract Classes Interfaces and Packages:** Using Standard Java Packages (util, lang, io, net), Exception Handling Exception types, uncaught exceptions, throw, built-in exceptions.

5. **Thread:** creating single and multiple threads, using threads in File handling

Readings:

1. Head First Java.
2. Java The Complete Reference.
3. Core Java Volume I-Fundamentals.
4. Core Java An Integrated Approach (also known as Java Black Book),Effective Java.
5. OCA Java SE 8.
6. Java Puzzler: Traps, Pitfalls, and Corner Cases.
7. The Java Language Specification.
8. Thinking in Java.
9. The Java™ Programming Language

C-6

Data Structure

1. **Basics terminologies:** Introduction to basic data Structures: Arrays, linked list, trees, stack, queue, Data structure operations; time complexity, space complexity.
2. **Stacks, Queues:** Stacks; Array representation of stack; Linked representation of stack; Various polish notation's-Prefix, Postfix, infix; Evaluation of a postfix & Prefix expression; Conversion from one another; Application of stack; Queues; Linked representation of queues; De queues; Circular queue; Priority queue.
3. **Searching and Sorting:** Searching algorithm: linear search, binary search; sorting algorithms: Bubble sort, Insertion sort, Selection sort, Quick Sort, Merge sort and Heap sort.
4. **Trees:** Binary trees; Representation of binary tree in memory; traversing binary tree; Binary search trees; Searching and inserting in binary search trees; Deleting in a binary search ,tree; AVL search trees; Insertion and deletion in binary search trees; Heap.
5. **Graphs:** Terminology & representation; Warshall algorithm; Shortest path; Minimum spanning tree; Kruskal &Dijkstara algorithm; Operation on graph; Traversing a graph.

READINGS:

1. *Data Structure* By Lipshutz, McGraw Hill.
2. *Data Structure*By Standish, Addison-Wesley.
3. *Data Structures using C* By A. M. Tennenbaum, Y. Langsam and M. J. Augenstein,PHI, 1991.

C-7

MOOC-1: Will be offered by UGC in 2nd Semester

PLACEMENT CELLS

The Placement Cell comprises a group of student volunteers, unlike many other campuses. It coordinates the placement activity on the campus for students in the final year of their programme of study. It designs and publishes a Placement Brochure, initiates dialogues with companies in various cities, and organizes interviews on campus for the convenience of students. It is also responsible for Industrial Training placements for MCA students in the 5th semester, M.Sc. (CS) students in the 3rd semester and B.Sc.(CS) students in the 5th semester. It also has a list of companies where our alumni have been placed. The activities carried out by the Cell provide the volunteers with hands-on experience in management and organization. Students may mail any queries regarding the Cell and its activities to place@cs.ac.in or placecell@gmail.com.

Postal Address

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Department of Computer Science and Information Technology
Central University of GGU
Phone: 07752-260356, 260209
Fax: 07752-260148
Email: place@cs.ac.in or .

ALUMNI CELLS

Our alumni's strong sense of belonging to the Department is one of its greatest assets. **Starting in 2012, the Alumni Cell, called "CSIT"**, aims at strengthening the links between the Department and its alumni cell. It is managed by an executive body consisting of current and ex-students. Alumni are critical stakeholders in Educational Institutions. University Ordinance provides for an Alumni association in the University. The membership of the Association shall be open to all degree holders of the University (in Arts, Science, Commerce, Medical, Engineering, Education and Law), including post-graduate diplomas and certificates. Provided that the students who have graduated as students from the colleges now affiliated to the University before the date of such affiliation shall also be eligible to be registered as graduates of the University for **this clause.** Application in the **Prescribed Form** may be submitted with a membership fee of Rs. 100 for annual membership or Rs. 1000/- for lifetime membership online.

Prof. A.K. Saxena
Head of the department,
Computer Science & Information Technology
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Copy to:
1. Secretary to VC for kind information of the Hon'ble Vice-Chancellor.
2. All Deans of Schools GGU University.
3. Registrar, GGU University.
4. Finance Officer, GGU University.
5. All H.O. D's with a request to circulate the notice through Teacher i/c Alumni

(H.O.D)

ALUMNI ASSOCIATION MEMBERSHIP FORM

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY (CSIT)
Guru GhasidasVishwavidyalaya,Bilaspur(C.G.)

MEMBERSHIP FORM

1. Name: ……..……

(In block capital, surname first)

2. Date of Birth: …… 3.Sex: …….

4. Permanent Address: (with PIN Code, Phone/Fax/e mail etc)

…….

…….

5. Present Address: (with PIN Code, Phone/Fax/e mail etc)

…….

…….

Mobile/ Phone No-(with STD code)…….……..…….……..

6. Present occupation: ……

7. Association with CS & IT Dept., GGV as a student/research scholar

From…….to……..…….....

Name of the Course or Programme……..……...

Year of degree/diploma obtained……...…….…….

Department……..…….....

8. Any notable achievements during your University days?

9. A brief resume of your academic/professional activities after you left Guru Ghasidas Vishwavidyalaya

10. Your special interest/achievement (sports, cultural and literary activities etc.)

11. Your suggestions for the future development of the University…….……...…...

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…...

12. D.D/Cheque No…….. Amount Rs……..…..……..

Date… …….. **Signature :**

Membership:

a) All post graduate/M.Phil./Ph.D, degree , diploma & Certificate holders of CS & IT Dept.GGU University.

b) Graduates from the colleges now affiliated to CS & IT Dept.GGU University prior to the date of affiliation.

Contact Numbers of Faculties

S.No.	Name of Faculties	Designation	Contact No.
1.	Dr. A.K. Saxena	Professor & HOD	94252-22744
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3.	Dr. Girish Kumar Singh	Associate Professor	94799-83851
4.	Dr. Shrabanti Mandal	Associate Professor	82690-76954
5.	Mrs. Pushplata Pujari	Assistant Professor	94252-62192
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11.	Dr. Akhilesh Kumar Sriwaws	Assistant Professor	90981-74759
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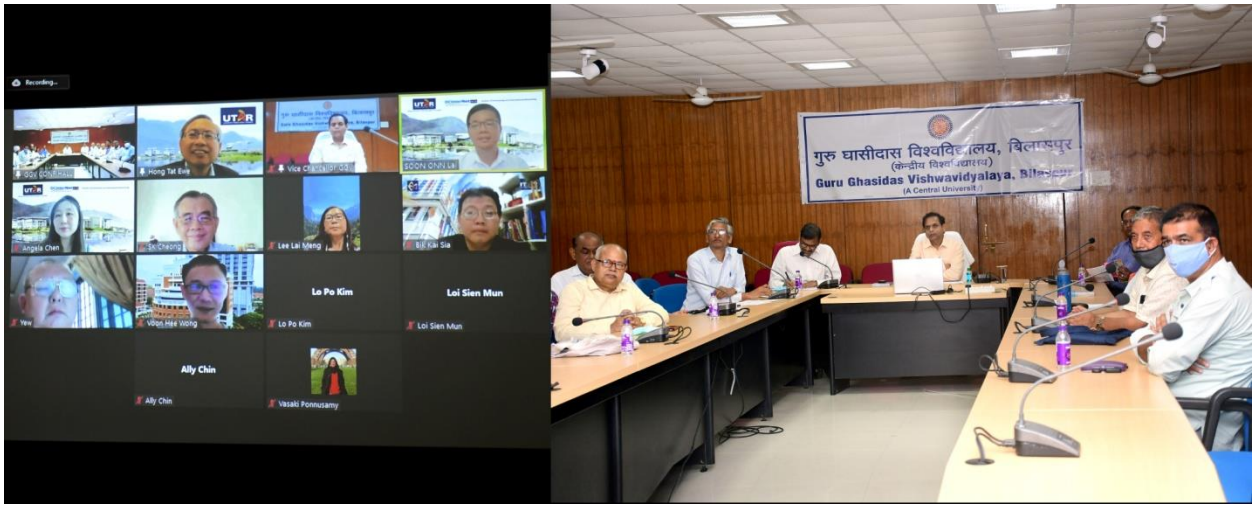

Meeting of GGV-UTAR Collaboration

Workshop on E-Governance on February 2012

Contact Address and Numbers

Sl.No	Name and Address	Mobile number and Email

Important Notice

The students are informed to see University website www.ggu.ac.in for latest updates on admissions, examinations, notices and other information. This handbook may be used as a basic source of information/ help at this time and should not / cannot be used as the source to claim any information. Please contact University Website / department / University in case of any clarification on any information.