Dr. Babasaheb Ambedkar Marathwada Univeristy

Aurangabad

Department of Computer Science & Information Technology

Reaccredited with 'A' Grade

Curriculum Book

M.Sc. Information Technology

2018-2019

Outcome Based Education Curriculum

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

DEPARTMENT OF COMPUTER SCIENCE AND
INFORMATION TECHNOLOGY

Syllabus Book of

M.Sc. (Information Technology)

Faculty of Science and Technology

w.e.f. ACADEMIC YEAR JUNE, 2018-19

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Department of Computer Science and Information Technology

Outcome Based Education Curriculum
M .Sc. Information Technology
(2018-2019)

SCHEME FOR CHOICE BASED CREDIT SYSTEM (CBCS)
w.e.f. JUNE, 2018 (ACADEMIC YEAR, 2018-2019 Onwards)

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M.Sc. (Information Technology) 2018-19

About the Revised Syllabus

- This version came into effect in June 2016. There have been many advancements in Computer Science and Information Technology and consequent changes in needs of society, industry in respect in which the syllabus was required to be updated.
- This document present the revised version of M.Sc. Information Technology syllabus which becomes effective for teaching with immediate effect. It is designed to facilitate students in the development of concept based approach for problem solving using IT as a tool. The self-learning approach is built in the syllabus thereby training the candidate to update themselves on the changing technologies in their area of work. The outstanding syllabus has been designed to produce junior programmers, EDP Assistants, web designers, etc. equipped with latest knowledge and skills.

About Admission Procedure

Department of Computer Science and Information Technology adopted a credit-based system under the Academic Flexibility Program of the University from the academic year 2011-12.

It is a flexible, cafeteria-type learning system with an inbuilt horizontal mobility for students to all desire units of education in the Department/Departments with provision for even inter Departmental mobility for students. CBCS operates on modular pattern based on module/units called "credits", wherein 'credit' defines the quantum of contents/syllabus prepared for a course/paper and determines the minimum number of teaching-learning hours required

OBE & CBCS permits students to:

- Learn at their own pace,
- Choose electives from a wide range of elective courses offered by the department,
- Undergo additional/value added courses and acquire more than the required number of credits, depending upon the learner aptitude,
- Adopt an interdisciplinary approach in learning,
- Make best use of the expertise of faculty across the Department, beside the particular department faculty
- Acquire knowledge, skill and attitude of learning outcomes through participatory teaching and learning and continuous evaluation process

This provides the flexibility to make the system more responsive to the changing needs of our students, the professionals and society. The credit-based system also facilitates the transfer of credits.
Courses offered by the Department
1. M. Sc. Computer Science
2. M. Sc. Information Technology
3. M. Phil. Computer Science

Admission/ Promotion: M. Sc. Information Technology
Duration: Four Semesters means Two Academic Years
Intake: 32
Eligibility:
i) Any Science Graduate with at least one optional subject as Computer Science/ Information Technology/ Mathematics/ Electronics/ Physics OR
ii) Any Science graduate having Mathematics as one of the subject in XII Standard OR
iii) B.E./ B. Tech.
Course Objective: [OBE]
Fees

Total Fees	**15,000/Year**

***Fees likely to be modified as per the university rule and regulation from time to time and will be applicable to the concern students**

Admission to the M. Sc. Computer Science and M. Sc. Information Technology course in the department will be done on the performance of CET score and on their performance in the qualifying graduate level examination.

The student will apply on the application form of the University provided with the prospectus/e-prospectus. Once the student is admitted to the concern department/ course, he/she will be promoted to next semester with full carryon; subject to the registration of student in every consecutive semester. Dropout student will be allowed to register for respective semester as and when the concerned courses are offered by the department, subject to the condition that his/her tenure should not exceed more than twice the duration of course from the date of first registration at parent department. The admission of concern student will be automatically get cancelled if he/she fails to complete the course in maximum period (Four years/Eight semesters)

Credits and Degrees

i) A candidate who has successfully completed all the core courses, Elective/ Specialized courses and, seminars and project prescribed and or optional service courses approved by the University for the program with prescribed CGPA shall be eligible to receive the degree.

ii) One Credit shall mean one teaching period of one hour per week for one semester (of 15 weeks) for theory courses and two practical/laboratory/field/demonstration hours/ week for one semester.

iii) Every student will have to complete at least 100 credits to obtain the master's degree of M. Sc.

Computer Science/ M. Sc. Information Technology (Post graduate degree) out of which 96 credits should be from this Department and four or eight credits of service courses from this or other Department. However the Department can design the curriculum of more credits and it will be compulsory for the students of this Department to complete the credits accordingly

Courses

(i) Core Course: - A core course is a course that a student admitted to M. Sc. Computer Science/ M. Sc. Information Technology program must successfully completed to receive the degree. Normally no theory course shall have more than 4 credits.

(ii) Elective Course: Means optional course from the basic subject or specialization. The elective course defined specialization that student want to perceive. The horizontal learning path is to be followed by the student for selection of elective course. Department may offer more than one specialization depending availability of resources.

(iii) Service course (SC): The service courses will be offered in third and fourth semesters in the department. Student should complete one service course in each semester.

(iv) Each Course shall include lectures / tutorials / laboratory or field work / Seminar / Practical training / Assignments / midterm and term end examinations/ paper / Report writing or review of literature and any other innovative practice etc., to meet effective teaching and learning needs.

(iv) Bridge Course: This course specially designed to provide subject prerequisites / skills required by the student prior to learning the defined course in curricula.

Course Code	Course Title
T1	C++
T2	Data Structure
T3	DBMS
T4	Software Engineering
T5	Operating System
T6	Computer Organization
T7	Fundamentals of mathematics and Statistics
CS	Communication Skill
P1	Practical on C++(T1)
P2	Practical on DS(T2)
P3	Practical on DBMS(T3)
P4	Practical on OS(T5)
P5	Practical on CO(T6)

(v)Attendance: - Students must have 75% of attendance in each Core and Elective course for appearing the examination. However student having 65% attendance with medical certificate may apply to the H.O.D. for commendation of attendance.

Registration for Service Course:

i) The student will register the service course of his interest after the start of semester in the concerned department on official registration form. The teacher in-charge of the respective course will keep the record of the students registered. Maximum fifteen days period will be given from the date of admission for completion of registration procedure. The Departmental Committee shall follow a selection procedure after counselling to the students etc. to avoid overcrowding to particular course(s) at the expense of some other courses.

ii) No student shall be permitted to register for more than one service course in a semester.

iii) The University department shall decide the maximum number of students in each service course taking into account the teachers and Physical facilities available in the Department.

iv) The University may make available to all students a listing of all the courses offered in every semester specifying the credits, the prerequisites, a brief description or list of topics the course intends to cover, the instructor who is giving the courses, the time and place of the classes for the course. This information shall be made available on the University website.

v) Normally no service course shall be offered unless a minimum of 10 Students are registered.

vi) The student shall have to pay the prescribed fee per course per semester/year for the registration as decided by the University.

Departmental Committee:

Every P.G. program of the University/College shall be monitored by a committee constituted for this purpose by the Department. The Committee shall consist of H.O.D. as a Chairman and some/all the teachers of the Department as its members.

Results Grievances Redressal Committee:

The department shall form a Grievance Redressal Committee for each course with the Course Teacher and the HOD. This Committee shall solve all grievances relating to the Assessment of the students.

Awards of Grades

(i) A ten point rating scale shall be used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Master's Program. Grade points are based on the total number of marks obtained by him/her in all the heads of examination of the course. These grade points and their equivalent range of marks are shown separately in Table-I.

Sr. No	Equivalent Percentage	Grade Points	Grade	Grade Description
1.	90.00 – 100	9.00 – 10	O	Outstanding
2.	80.00 – 89.99	8.00 – 8.99	A++	Excellent
3.	70.00 – 79.99	7.00 – 7.99	A+	Exceptional
4.	60.00 – 69.99	6.00 – 6.99	A	Very Good
5.	55.00 – 59.99	5.50 – 5.99	B+	Good
6.	50.00 – 54.99	5.00 – 5.49	B	Fair
7.	45.00 – 49.99	4.50 – 4.99	C+	Average
8.	40.01 – 44.99	4.01 – 4.49	C	Below Average
9.	40	4.0	D	Pass
10.	<40	0.00	F	Fail

Table I: Ten Point Grades and Grade Description

ii) Non-appearance in any examination/ assessment shall be treated as the students have secured zero mark in that subject examination/assessment.
iii) Minimum D grade (4.00 grade points) shall be the limit to clear /pass the course/subject. A student with F grade will be considered as 'failed' in the concerned course and he/she has to clear the course by reappearing in the next successive semester examinations. There will be no revaluation or recounting under this system.
iv.) Every student shall be awarded Grade points out of maximum 10 points in each subject (based on 10
Point Scale). Based on the Grade points obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results will be announced at the end of each semester and cumulative Grade card with CGPA will be given on completion of the course.

Computation of SGPA (Semester grade point average) &CGPA (Cumulative grade point average)
The computation of SGPA &CGPA, will be as below:

a. **Semester Grade Point Average (SGPA)** is the weighted average of points obtained by a student in a semester and will be computed as follows:

$$SGPA = \frac{Sum(CourseCredit * Number\ of\ Points\ in\ concern\ gained\ by\ student)}{Sum(CourseCredits)}$$

The Semester Grade Point Average (SGPA) for all the four semesters will be mentioned at the end of every semester.

b. **The Cumulative Grade Point Average (CGPA)** will be used to describe the overall performance of a student in all semesters of the course and will be computed as under:

$$CGPA = \frac{Sum(All\ Four\ Semester\ Credits\ gained\ by\ the\ student)}{Sum(Credits\ of\ All\ Semesters)}$$

The SGPA and CGPA shall be rounded off to the second place of decimal.

Evaluation method:
Each theory course will be of 100 Marks and be divided in to internal examination (Sessional) of 20 Marks and Semester end examination of 80 Marks. (20+80 = 100 Marks). Each Practical course will be of 50 marks. Research project / Internship / field projects if any, will be of 100 marks.

a. Internal Evaluation Method
There shall be two mid semester examinations, first based on 40 percent syllabus taught and second based on 60 percent syllabus taught. The setting of the question papers and the assessment will be done by the concerned teacher who has taught the syllabus. Average score obtained out of two mid semester examinations will be considered for the preparation of final sessional marks/grade.

b. Term end examination and evaluation

i. Semester end examination time table will be declared by the departmental committee and accordingly the concern course teacher will have to set question paper, conduct theory examination, practical examination with external expert, evaluate, satisfy the objection / query of the student (if any) and submit the result to DC.
ii. The semester end examination theory question paper will have two parts (20+60 = 80 Marks)
iii. Template of question paper is designed in light of Outcome based education method and determine the attainment level of students. The pattern of question paper is as below
    a. Q1 will be based on (fill in the blanks/ multiple choice questions/ match columns / state true or false / answer in one sentence) as compulsory questions and it should cover entire syllabus and carries 20 Marks.
    b. Student will require to solve any five questions from Q2 to Q8 where Q2 of type **comprehension**, Q3 and Q4 are **application oriented**, Q5 based on **analysis**, Q6 will be on **synthesis**, Q7 checks **evaluation** ability of student, and Q8 on **Comprehension** ability.
iv. Semester end Practical examinations will be of 50 marks each and students will be examined by one external and one internal examiner. Seminar and Project work (if any) will be evaluated by the external examiners along with guide.
v. At the end of each semester the Committee of Department shall assign grade points and grades to the students.
vi. The Committee of Department shall prepare the copies of the result sheet in duplicate. Every student shall have the right to scrutinize answer scripts of Mid semester/Term end semester examinations and seek clarifications from the teacher regarding evaluation of the scripts immediately thereafter or within 3 days of receiving the evaluated scripts.
vii. The Head of the department shall display the grade points and grades for the notice of students. The head of the department shall send all records of evaluation for Safekeeping to the Controller of Examinations as soon as all the formalities are over.

Grade Card
The University shall issue at the beginning of each semester a grade card for the student, containing the
Grades obtained by the student in the previous semester and his Semester Grade Point Average (SGPA).
The grade card shall list:

(a) The title of the courses along with code taken by the student
(b) The credits associated with the course,
(c) The grade and grade points secured by the student,
(d) The total credits earned by the student in that semester.
(e) The SGPA of the student,
(f) The total credits earned by the students till that semester and
(g) The CGPA of the student (At the end of the IVth Semester).

Cumulative Grade Card

At the end of the IVth semester, the University shall issue Cumulative Grade Card to the Students showing details of Grades obtained by the student in each subject in all semesters along with CGPA and total credits earned.

Course Curriculum Abstract of M Sc. Information Technology

Semester I	Semester II	Semester III	Semester IV
Programming 1	Programming 2	Web Analysis & Development	• Field Work & Internship Program • Seminar
Analysis of algorithms	Relational Database Management System using SQL	Artificial Intelligence	
Advance Computer Network	Network Security	Cyber Forensics	
Advance Operating System	Fundamentals of Compiler Design	Advance Software Engineering	
Computational Mathematics			
Constitution of India	**Elective 1**	**Elective 2**	
Research Methodology	Technical Report Writing		

Program Specific Outcomes (PSOs) and Program Outcomes (POs)

M. Sc. Information Technology

1. Be able to fundamentally strong in Information Technology concepts.
2. Be able to design, implement and evaluate a technology – based system, process and components.
3. Be competent in engineering software for industrial applications.
4. An ability to identify opportunities for establishing an enterprise.
5. Be able to apply computational knowledge for information theory.
6. Ability to understand and apply fundamental research concepts.
7. Be able to provide services in the areas of communication technology.
8. An ability to get detail insight of advanced tools and technology for information processing.
9. To discover patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems.
10. Understand professional, ethical, legal, security, social issues and responsibilities.
11. Engage in independent and life-long learning for continued professional development.

Course Structure of M.Sc. Information Technology Course

Semester I					
Course Code	Course Title	No. of Credits	Marks		Total
			Internal	External	
CSI401	Constitution of India	2	20	30	50
CSI402	Research Methodology	2	10	40	50
CSI403	Programming 1	3	20	80	100
CSI404	Analysis of Algorithms	3	20	80	100
CSI405	Advance Computer Network	3	20	80	100
CSI406	Advance Operating System	3	20	80	100
CSI407	Computational Mathematics	3	20	80	100
CSI451	Practical based on CSI403	2	-	50	50
CSI452	Practical based on CSI404	2	-	50	50
CSI453	Practical based on CSI405	2	-	50	50
CSI454	Practical based on CSI406	2	-	50	50
CSI455	Practical based on CSI407	2	-	50	50
Total No. of Credits		**29**			

Semester II					
Course Code	Course Title	No. of Credits	Marks		Total
			Internal	External	
CSI408	Research proposal and Review writing	1	10	40	50
CSI409	Programming 2	3	20	80	100
CSI410	Relational Database Management Systems using SQL	3	20	80	100
CSI411	Network Security	3	20	80	100
CSI412	Fundamentals of Compiler Design	3	20	80	100
CSI481	**Elective 1**	3	20	80	100
CSI456	Practical based on CSI409	2	-	50	50
CSI457	Practical based on CSI410	2	-	50	50
CSI458	Practical based on CSI411	2	-	50	50
CSI459	Practical based on CSI412	2	-	50	50
CSI460	Practical based on CSI481-490	2	-	50	50
Total No. of Credits		**26**			

Semester III					
Course Code	**Course Title**	**No. of Credits**	**Marks**		**Total**
			Internal	**External**	
CSI413	Web Analysis & Development	3	20	80	100
CSI414	Artificial Intelligence	3	20	80	100
CSI415	Cyber forensic	3	20	80	100
CSI416	Advanced Software Engineering	3	20	80	100
CSI491	**Elective 2**	3	20	80	100
CSI417	**Service Course**	4	20	80	100
CSI461	Practical based on CSI413	2	-	50	50
CSI462	Practical based on CSI414	2	-	50	50
CSI463	Practical based on CSI415	2	-	50	50
CSI464	Practical based on CSI416	2	-	50	50
CSI465	Practical based on CSI491-499	2	-	50	50
	Total No. of Credits	**29**			

Semester IV (Industrial Internship / Field Work Projects)

Paper Code	Course	Total Theory Credits	Total Practical Credits	Internal	External	Total
CSC471	Dissertation Review 1	-	3	50	-	50
CSC472	Dissertation Review 2	-	3	50	-	50
CSC473	Dissertation Review 3	-	3	50	-	50
CSC474	Final Dissertation	-	5	-	100	100
CSC475	Seminar	-	2	-	50	50
			16			

Programming Group

Programming Group	Semester I Programming 1 (CSI403)	Semester II Programming 2 (CSI409)
Java Group	Core Java	Advance Java
Microsoft Group	Advance C++	VB.NET
Open Group	Python	Advance Python

Elective Group

Elective Group	Elective 1(CSI481-490)	Elective 2 (CSI491-499)
Data Science	Data mining & Data Warehousing	Big Data Analytics
Remote Sensing and Geospatial Technology	Remote sensing & GIS	Geospatial Technology
Pattern Analysis	Digital Image processing	Pattern Recognition
Advance Technologies	Internet of things	Cloud Computing

(CSI 417)Service Courses

Course Title
• Communication Skill
• Intellectual Property Rights
• Development of Soft Skill and Personality
• R-Tool
• Android Programming

Total Number of Credits

Semester	Credit
Semester I	29
Semester II	26
Semester III	29
Semester IV	16
Total Number of Credits	**100**

Detailed Syllabus

Semester – I

1. Constitution of India

Course Code	**CSI401**	**Course title**	**Constitution of India**
Number of Credits	**2 Credits**	**Internal / External**	**20/30**
Total Contact Hours (Th)	**2 Hrs/week**	**Total Contact Hours (Pr)**	**-**

Prerequisite: there is no prerequisite for the course

Course Objectives:

- Student will be able to understand the constitution of India
- Student will be able to know the constitutional and fundamental rights.

Course Outline:

Unit 1: History of Making of the Indian Constitution: History & Drafting committee, (composition &Working)

Unit 2: Philosophy of the Indian Constitution: Preamble, Salient Features

Unit 3: Contours of constitutional Rights & duties: Fundamental Rights - Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and educational rights, Right To Constitutional Remedies, Directive Principles of State Policy, Fundamental duties

Unit 4: Organs of Governance: Parliament – Composition, Qualification and disqualification, Power and function, Executive – President, Governor, Council of Ministers, Judiciary - Appointment and Transfer of Judges, Qualifications, Power and Function

Reference Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian constitution, 1st Edition, 2015.
3. M. P. Jain, Indian constitution Law, 7th Edn, Lexis Nexis, 2014.
4. D. D. Basu, Introduction to India, Lexis Nexis, 2014.
5. M. P. Jain, outline of Indian Legal and Constitutional history, Lexis Nexis, 2014.
6. ग्रॅनव्हिल ऑस्टिन ,संघटना राष्ट्राची कोनशीला , डायमंड प्रकाशन , पुणे , २०१३.
7. भारताचे शासन आणि राजकारण , विद्या प्रकाशन , नागपूर.

Note:

1. All latest volumes of above mentioned books must be preferred. The above list of Books is not an exhaustive one.
2. This Course is bilingual (English & Marathi), The Examination Will also be bilingual

2. Research Methodology

Course Code	**CSI402**	**Course title**	**Research Methodology**
Number of Credits	**2 Credits**	**Internal / External**	**10/40**
Total Contact Hours (Th)	**2 Hrs/week**	**Total Contact Hours (Pr)**	**-**

Prerequisite: There are no perquisites required for attending this course.

Course Objectives: following are the objectives of the course

- Foundations and principals behind engaging research are inculcated.
- Student will be able to understand various methods/mechanism involved in problem solving, reviewing and testing of hypothesis

Course Outline:

Unit 1: Introduction: Meaning, Concept, nature steps types and characteristics of research, Identification & formulation of Research Problem, Hypothesis, Research Design & Research Ethics.

Unit 2: Review of literature: Need for Reviewing Literature, what to Review and for what purpose, Literature search Procedure, Sources of Literature, Planning of Review work, Note Taking.

Unit 3: Types and Methods of Research: Classification of Research, Pure and Applied Research, Exploring or Formulative Research Descriptive Research, Diagnostic Research / Study, Evaluation Research / studies, Action Research, Experimental Research, Analytical study of statistical Method, Historical Research, Surveys, Case Study, Field Studies.

Unit 4: Methods & tools of data collection: Concept of sampling and other concepts related to sampling. Probability and non - probability samples, their characteristics and implications. Tools of data collections, their types, attributes and uses. Redesigning, research tools - like questionnaire, opinnaere, observation, interviews, scales and tests etc.

Unit 5: Methods of data analysis: Editing, Classification and Coding, Transcription, Statistical Analysis, Measures of Central Tendency Measures of Dispersion, Measures of Association/ Relationship, Regression and Correlation Analysis, Hypothesis Testing (For Proportion and Means), Test of Significance.

Reference Books:

1. Briony J. Oates., (2006), Researching Information Systems and Computing, SAGE Publications, New Delhi.
2. Kothari C.R., (2004), Research Methodology Methods & Techniques, New Age International Publishers, New Delhi.
3. Bajpai S. R., (1975), Methods of Social Survey and Research, Kitabghar, Kanpur.
4. Bhattacharya D. K., (2004), Research Methodology, New Delhi, Excel Books.
5. Brymann Alan and Carmer D., (1995), Qualitative data analysis for social / scientist, New York, Routledge publication.
6. Best J. W. and Khan J. V., (2005), Research in Education New Delhi, Prentice Hall India. Hans Raj (19gg) Theory and practice in Social Research, Surjeet publication, Kolhapur.
7. Chandera A. and Saxena T. P., (2000), Style Manual, New Delhi, Metropolitan Book Comp. Ltd.
8. Krishnaswami O. R., (1988), Methodology of Research in Social Science, Himalaya pub House.
9. Kothari, C. R., (2005), Quantitative Technique, New Delhi, Vikas publication House.
10. Gautam N. C., (2004), Development of Research tools, New Delhi, Shree Publishers.
11. Gupta, Santosh, (2005) Research Methodology and statistical Techniques, Deep and Deep publications.
12. Shukla J. J., (1999) Theories of Knowledge, Ahmadabad, Karnavati Publication

E-References:

1. https://www.slideshare.net/annakittystefen/researchmethodologymethodsandtechniquesbycrkothari
2. https://www.wisdomjobs.com/e-university/research-methodology-tutorial-355.html

Course Outcomes:

- Critically analyze research methodologies identified in existing literature.
- Choose appropriate quantitative or qualitative method to collect data.
- Propose and distinguish appropriate research designs and methodologies to apply to a specific research project.
- Develop a comprehensive research methodology for a research question.
- Apply the understanding of feasibility and practicality of research methodology for a proposed project.

3. Programming 1

Course Code	**CSI403**	**Course title**	**Programming 1**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

The Department has adopted the horizontal format for programming group which will help the students to become master regarding that programming group. Regarding 2018-19 the Department has selected the Java group.

Prerequisites:

- The student (s) should holds good skills on functional programming concepts, fundamental object oriented concepts.
- Student(s) should select wither group prior so that there are of expertise nurtured by the department by providing them training on the selected platform.

Course Objectives: following are the objectives of the course

- Provide student an opportunity to learn and develop basic skills required in writing programs
- Student will be provided horizontal learning path where they will be able to select the technology trends such as Java Group, Microsoft Group, and Open System Group.
- Programming 1 will help to develop the foundation for programming 2 and programming 3 course Student will be able to write programs for generating solutions.

A. Course Outline: Java Group (Core Java)

Unit 1: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Unit 2: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.

Unit 3: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Unit 4: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing.

Unit 5: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming

Reference Books:

1. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.
2. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
3. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.
4. Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.
5. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
6. Java Programming, D. S. Malik, Cengage Learning

Web References:

1) https://www.tutorialspoint.com/java/index.htm
2) https://www.tutorialspoint.com/java/java_tutorial.pdf

Lab Exercises:

1. Program to define a structure of a basic JAVA program.
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers

Course Outcomes:

- On successful completion of this course, the student should be able to:
- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard.
- Understand the basic principles of the object-oriented programming.
- Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.

4. Analysis of Algorithms

Course Code	**CSI404**	**Course title**	**Analysis of Algorithms**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

Prerequisite: to have basic knowledge of mathematics.

Course Objectives: following are the objectives of the course

- To teach techniques for effective problem solving in computing.
- To study efficient ways to solve a problem.

Course Outline:

Unit 1: Introduction to Analysis of Algorithm, Design & analysis fundamental, Space and time complexities, Growth of function (Notation Omega and Theta), Asymptotic (alpha, beta, gamma) Analysis. Linear and non linear data structure like stack, queues, linked lists, trees, graph, searching algorithms linear and binary searching. Sorting algorithms like bubble, selection, insertion, quick, merge, radix.

Unit 2: Randomized (Quick sort) and Recursive algorithm, Divide and concurrent method e.g. binary search, Merge sort, quick sort etc… Partition algorithm, Select and radix sort, Greedy method, Single source shortest path.

Unit 3: Graph :representation, types, Dijkstra's algorithm, Bellman ford algorithm, BFS,DFS, Travelling salesman problem, All pair shortest path, Single source shortest path, Trees: Representation, types, binary tree, BST, threaded binary tree, extended binary tree Spanning tree: Kruskal's and Prim's algorithm.

Unit 4: String The String abstract data type, String Matching Algorithm, Navie Bayes ,Brute-Force Algorithm, Robin-Karp Algorithm, Morris-Pratt Algorithm, Boyer-Moore String algorithm.

Unit 5: NP Completness, Basic concept:-non deterministic algorithm, NP hard and NP complete classes.

Reference Books:

1. Introduction to Algorithms "Thomson Coremen"
2. Data Structures and algorithms "Alfred U. Aho"
3. Fundamental of data structure using Java.
4. Tutorialspoint.com/datastructure/java

Lab Exercise: CSI452 Practical based on CSI404:

Find worst case, best case and average case for linear searching algorithm.

1. Write a program for Quick sort method to find time complexity for given n numbers.
2. Write a program to find space complexity for bubble sort and insertion sort method.
3. Create a binary search algorithm with recursion.
4. Write a program to sort the number using radix sort algorithm.
5. Find single source shortest path algorithm using Dijkstra's algorithm and justify how it is a greedy algorithm.
6. Write a program for BFS.
7. Write a program for BFS.
8. Write a program for String matching using Navie Bayes algorithm.
9. Write a program for different operations of binary tree.

Course Outcomes:

- After completing this course, students will be able to: Understand structure and behaviour of Algorithms, Better scope to write effective programs, the course content helpful in the preparation of UGC- SET/NET, DRDO entry level Examinations.
- This course will be the basic course for learning Algorithms and Approximation of Algorithms related research.
- This course is designed for the students to learn principals of Data structure, Algorithms and understand issues related to allocation of memory, optimization of Algorithms, Time and Space Complexity associated with Algorithms, Sorting, Searching Algorithms applied on data structures.
- The students will be able to understand the fundamental of data structure and analysis of algorithms.

5. Advance Computer Network

Course Code	**CSI405**	**Course title**	**Advanced Computer Network**	
Number of Credits	**3 Credits**	**Internal / External**	**20/80**	
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**	

Prerequisite: to have basic knowledge of computer networking.

Course Objectives: following are the objectives of the course

- To provide the student with a top down approach of networking starting from :
- To Study various structure and topologies of communication mediums.
- Topics covered include: network protocols, Network architecture, network security, and some special topics like wireless and sensor networks.
- The focus is on both: the existing technologies as well as the current and emerging research topics in computer networking.

Course Outline:

Unit 1: Introduction: Data Communication, Network Protocols and Standards, Point to Point and Multi Point line configuration, Network Topologies: Mess, Star, Tree, Bus, Ring, concept of frequency, bandwidth, and modes of communication.

Data Communications and Networking Overview: A Communication Model - Data Communications - Data Communication Networking, Protocol Architecture: Need - A Simple Protocol Architecture - OSI - TCP/IP Protocol Architecture, Guided Transmission Media - Wireless Transmission, Signals: Analog and Digital signals, Periodic and Aperiodic signal.

Unit 2: Digital Data Communication Techniques: Asynchronous and Synchronous Transmission - Types of Errors - Error Detection - Error Correction, Data Link Control Protocols: Flow Control - Error Control – High - Level Data Link Control. Multiplexing: Frequency division, Wave division and Time division multiplexing.

Unit 3: Circuit Switching and Packet Switching: Switched Communication Networks - Circuit - Switching Networks - Concepts - Packet-Switching Principles - X.25 - Frame Relay, Routing in Networks. Congestion in Data Networks: Effects of Congestion - Congestion Control - Traffic Management.

Unit 4: Local Area Network Overview - LAN Protocol Architecture - Bridges. High-Speed LANs - The Emergence - Ethernet - Token Ring - Fiber Channel. IEEE 802 standards, Ethernet, Token Bus, Token Ring, FDDl, Wireless LAN Technology.

Unit 5: Internet Protocols: Basic Protocol Functions - Principles of Internetworking - Connectionless Internetworking - Internet Protocol, IP Addressing, DNS, Network Security - Security Requirements and Attacks - Confidentiality with Symmetric Encryption - Message Authentication and Hash Function - Public - Key Encryption and Digital Signatures, Firewalls.

Reference Books:

1. William Stallings, "Data Computer Communications", Seventh Edition, Pearson Education Pte. Ltd., New Delhi: 2004.
2. Behrouz and Forouzan,"Introduction to Data Communication and Networking", Tata McGraW Hill Publishing Company Ltd., New Delhi: 1999.
3. Tannenbaum A.S "Computer Networks" PHI.

Web References:

1. http://nptel.ac.in/downloads/106105080/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-829-computer-networks-fall-2002/

Lab Exercise: CSI453 Practical based on CSI405:

Network Settings, Network connections Troubleshooting, Study of various networking devices, Crimping of cables, identifying color codes, Sharing and its types, Remote Access of a PC, Creating LAN and its settings, Creating Wi-Fi and it's settings; etc. along with some case studies.

1. Study and identify various networking devices.
2. Identify topologies.
3. Crimping technique and color codes.
4. Sharing data and various types of it.
5. Design and Implement your own cipher using any programming language.
6. Using Ethernet to connect two systems.
7. Implement following classical encryption techniques.
8. Intrusion Detection/Prevention Systems (case study)
9. Firewalls -Case Study
10. Wireless network security -Case Study
11. Web and DNS security Techniques
12. Install any Proxy Server and configure an application gateway.
13. Study and identify various networking devices.
14. Identify topologies.
15. Crimping technique and color codes.
16. Sharing data and various types of it.
17. Design and Implement your own cipher using any programming language.
18. Using Ethernet to connect two systems.
19. Implement following classical encryption techniques.
20. Intrusion Detection/Prevention Systems (case study)
21. Firewalls -Case Study
22. Wireless network security -Case Study
23. Web and DNS security Techniques
24. Install any Proxy Server and configure an application gateway.

Course Outcome:

The student will be well acquainted with how computer network works, what are the architectures and protocols required for it, as well as some special topics.

6. Advance Operating System

Course Code	CSI406	Course title	Advanced Operating System
Number of Credits	3 Credits	Internal / External	20/80
Total Contact Hours (Th)	3 Hrs/week	Total Contact Hours (Pr)	4 Hrs/Week

Prerequisite: to have basic knowledge of disk operating system.

Course Objectives:
This course introduces basic issues in operating systems. Topics include Threads, processes, concurrency, memory management, I/O Control and case studies.

- To make students able to learn different types of operating systems along with concept of file systems and CPU scheduling algorithms used in operating system.
- To provide students' knowledge of memory management and deadlock handling algorithms.
- To provide Hands-on study of Linux operating system design and kernel internals, Thread Programming.

Course Outline:
Unit 1: Overview: Introduction, history of operating system, **Memory Management:** Processes in memory, Logical addresses, **Partitions:** static versus dynamic, free space management, external fragmentation, Segmented memory, **Paged memory:** concepts, internal fragmentation, page tables, Demand paging/segmentation, **Replacement strategies:** FIFO, LRU (and approximations), NRU, LFU/MFU, MRU, **Cache Management:** Allocation and de-allocation techniques, coherence technique,

Unit 2: Processes and Scheduling: Job/process concepts, Scheduling basics: CPU-I/O interleaving, (non-)preemption, context switching, Scheduling algorithms: FCFS, SJF, SRTF, priority scheduling, round robin, Combined schemes Process details like creation PCB, process view, Thread and inter-process Communication,

Unit 3: Lower Process Management, Synchronization Primitives: Atomic instructions, locks, spinlocks, mutex semaphores, counting semaphores, and their use in solutions to Producer Consumer synchronization. **Classic Synchronization Problems:** Classic synchronization problems: Producer Consumer, Dining Philosophers, Readers and Writers, Sleeping Barber. **Monitors and Message Passing:** Monitors, condition variables, message passing, and their use in solutions to classic synchronization problems: Producer Consumer, Dining Philosophers, Readers and Writers, Sleeping Barber. **Deadlock:** Definition, Characteristics A resource Allocation graph, live lock, Deadlock prevention, Deadlock avoidance: Banker's Algorithm, Deadlock Detection and Recovery.

Threads: Overview of threads, thread basics and its advantages, Multicore Programming: Introduction, Amdhal's law, multicore programming challenges, types of parallelism, Multithreading Models, **Thread Libraries:** OpenMP: shared memory architecture, fork-join model, OpenMP directives ,schedule and programming constructs. Pthread: introduction, basic programming constructs of Pthreads, Aspect of implicit and explicit threading and threading issues.

Unit 4: I/O Management: I/O buffering, Single and Double Buffer schemes, Disk Organization. **File Management:** File Concepts, File descriptor, Access methods: Sequential, indexed and direct, File sharing, Protection, Access rights, File System structure, Byte Sequence, Record sequence and Tree-based, Recovery and Disk formatting. **Secondary Storage Management:** File allocation methods: Contiguous Allocation and Non Contiguous allocation, Chained, Indexed allocation, free space management, Disk Scheduling: FCFS, SSTF, SCAN and C- SCAN, Disk Cache. Protection and Security: System performance, protection and security, policies and methods, Access Matrix.

Unit 5: Introduction: History of Linux, Features of Linux, Drawbacks of Linux, Components of Linux, Memory Management Subsystems, Linux Process and Thread Management, File Management System, Device Drivers **Linux Commands and Utilities:** cat, tail, cmp, diff, wc, sort , mkdir, cd, rmdir, pwd, cp, more, passwd, who, whoami, mv, chmod, kill, write, wall, merge , mail, pipes, filters and redirection utilities. **Shell Scripts:** Creating and executing simple shell programs, variables, and special characters, comparison of expressions, iteration statements, and conditional statements functions. **System Administration:** Installing Linux, Booting the system, Maintaining user accounts, File systems and Special Files, Backups and Restoration.

Books:

- Operating Systems Concepts, 8th edition, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne; Wiley, ISBN 0-470-12872-0,2010.

Reference Books:

1. Operating Systems: Internals and Design Principles, 6th edition, William Stallings; Prentice Hall, ISBN-10: 0136006329, Operating Systems, 3rd edition
2. Modern Operating Systems, Andrew S. Tanenbaum; Prentice Hall, ISBN-10: 0-13-600663-9, 2008, 3rd edition.
3. Using OpenMP, Portable Shared Memory Parallel Programming ,Barbara Chapman, Gabriele Jost and Ruud van der Pas, MIT Press, ISBN: 9780262533027 ,2007

Web:

1. http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir
2. http://openmp.org/wp/resources/
3. http://www.compunity.org/training/tutorials/3%20Overview_OpenMP.pdf

Lab Exercise: CSI454 Practical based on CSI406:

At least five experiments should be carried out on each unit.
By considering the sample experiment list as guidelines:

- Implementing a CPU scheduling policy in a Linux OS.
- Implementing a memory management policy in a Linux OS.
- Implementing a file system in a Linux OS.
- Process control system calls: The demonstration of fork, execve and wait system calls along with zombie and orphan states.
- Thread management using OpenMP API.: Thread execution, Static scheduling, Dynamic scheduling, Synchronization Conctructs in OpenMP, Data Handling, Library function, Environment variables.

- Thread synchronization using counting semaphores and mutual exclusion using mutex. Application to demonstrate: producer consumer problem with counting semaphores and mutex.
- Deadlock Avoidance Using Semaphores
- Implement the deadlock free solution to Dining Philosophers problem to illustrate the problem of deadlock and/or starvation that can occur when many synchronized threads are competing for limited resources.
- Demonstrate the following CPU Scheduling Algorithms
  a. FCFS b. SJF c. Priority d. Round Robin
- Demonstrate all Page Replacement Algorithms
  a. FIFO b. LRU c. MRU
- Simulate Bankers algorithm for Deadlock Avoidance
- Simulate Bankers Algorithm for deadlock Prevention

Course Outcomes:

Students who complete this course successfully are expected to:

- Gain extensive knowledge on principles and modules of operating systems
- understand key mechanisms in design of operating systems modules
- Understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks.
- Compare performance of processor scheduling algorithms.
- Produce algorithmic solutions to process synchronization problems.
- Use modern operating system calls such as Linux process and synchronization libraries.
- Learn thread and multicore programming

7. Computational Mathematics

Course Code	**CSI407**	**Course title**	**Computational Mathematics**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

Prerequisite: to be skilled in computer science and many advance mathematical techniques.

Course Objectives:

- To create the basic foundation of mathematical techniques largely used in Computer Science and Information Technology.
- This course covers possibly required mathematics for application development.

Course Outline:

Unit 1: Numerical Analysis: Floating point representation, arithmetic operations with normalized floating point numbers, errors in numbers, iterative methods, bisection method, false position method, Newton Raphson iterative method, secant method, Numerical integration, Simpson's rule, Trapezoidal Rule, Range Kutta method.

Unit 2: Set theory and relations: Sets- Elements of a set, methods of describing a set, types of sets, Operations on sets- union, intersection and difference of sets, Venn diagrams, statement problems, Associative Laws, Distributive laws, DeMorgan‟s laws, duality, partitioning of a set. **Relation**: Basic definition of relation and types of relations, graphs of relations, properties of relations, recurrence relations, Matrix representation of a relation.

Unit 3: Algebra of Logic, Mathematical Induction: Propositions and Logic operations, truth tables, arguments and validity of arguments, propositions generated by a set, equivalence and implication laws of logic, Quantifiers, Principle of Mathematical Induction, the rules of sum and products, permutations, combinations, generation of permutation and combinations, discrete probability, conditional probability.

Unit 4: Graph Theory: Various types of graphs- Simple and multi graphs, directed and undirected graphs, Eulerian and Hamiltonian graphs, Graph connectivity, graph traversals, graph optimizations, graph coloring, Trees, spanning trees.

Unit 5: Linear System: Linear System of equations, pivoting strategies, determinant of matrix, matrix factorization, norms of vector and matrices, Eigenvalues and Eigenvectors.

Reference Books:

1) Alan Doerr, Applied Discrete Structures for Computer Science, Galgotia Publications.
2) Kolman and Busby ―Discrete Mathematical structures for Computer Sciences PHI.
3) C L Liu, D P Mohapatra, " Elements of Discrete Mathematics" 3rd edition, McGraw Hill, 2008
4) Balguruswami, "Numerical Methods" Tata McGraw Hill, 2009.
5) G.D. Smith, "Numerical Solution of Partial Differential Equations: Finite Difference Methods", 3rdedition, Oxford University Press, 1985.

Web references:

1) https://web.stanford.edu/class/cs103/notes/Mathematical%20Foundations%20of%20Computing.pdf

Lab Exercise: CSI455 practical based on CSI407:

These assignments can be performed by writing programs using various platforms such as, Python, Matlab, and C++ etc.

1) Program to find set Union, Intersection, and Difference.
2) Program for matrix operations: add, subtract, multiply, transpose
3) Program for finding roots of the equation by different numerical methods.
4) Program to demonstrate use of Boolean Algebra Laws.
5) Program for finding Combinations and Permutations of the numbers.
6) Program for finding relations between sets and given numbers.
7) Program for finding path in the graph.
8) Program for finding Eigenvalues.

Course Outcomes:

- Students are able to perform Mathematical operations based on crisp Sets, Numerical Analysis and Probability.
- The theoretical component of the course treats fundamental concepts, as well as some
- Necessary topics in numerical linear algebra. The practical component of the course
- Addresses the computer implementation of these methods.
- In this way, students can develop a solid foundation for employment or further study in a wide range of scientific and engineering fields that rely on numerical modeling.

Semester II

1. Research Proposal and Review Writing

Course Code	**CSI408**	**Course title**	**Research Proposal and Review Writing**
Number of Credits	**1 Credits**	**Internal / External**	**10/40**
Total Contact Hours (Th)	**1 Hrs/week**		

Prerequisite: The student should be able to identify the problem in respective domain. The student should be cleared with the fundamental of research methodology

Course Objectives:

- To understand the genre and manipulated structure of the selected document.
- To convey clearly cogently and correctly through written media, the technical aspects.
- To work collaborately and individually to research to analyze and to write about public debates regarding the conduct of science & technology

Course Outline:

Unit 1: Introduction: Meaning, Concept, nature steps types and characteristics of research, Identification & formulation of Research Problem, Hypothesis, Research Design & Research Ethics. **Review of literature:** Need for Reviewing Literature, what to Review and for what purpose, Literature search Procedure, Sources of Literature, Planning of Review work, Note Taking.

Unit 2: Development of research proposal: Research proposal and its elements, Formulation of research problem: criteria of sources and definition, Development of objectives and characteristics of objectives, Development hypotheses and applications.

Unit 3: Methods & tools of data collection: Concept of sampling and other concepts related to sampling. Probability and non - probability samples, their characteristics and implications. Tools of data collections, their types, attributes and uses. **Redesigning, research tools:** like questionnaire, opinnaere, observation, interviews, scales and tests etc. **Field Work:** The Nature of Field Work, Selection and Training of Investigators, Sampling Frame and Sample Selection, Field Operation, Field Administration.

Unit 4: Methods of data analysis: Editing, Classification and Coding, Transcription, Statistical Analysis, Measures of Central Tendency Measures of Dispersion, Measures of Association / Relationship, Regression and Correlation Analysis, Hypothesis Testing (For Proportion and Means), Test of Significance. **Report writing and evaluations:** Types of Reports, Planning of Report Writing, Research Report Format, Principles of Writing, Documentation, Data and Data Analysis reporting in a Thesis, Writing of Report, Typing of Report, Briefing. Use of Anti-plagiarism software and its importance.

Unit 5: Case study formats of research proposal writing.

Reference Books:

1. BrionyJ.Oates. (2006), Researching Information Systems and Computing, SAGE Publications, New Delhi.
2. Kothari C.R., (2004), Research Methodology Methods & Techniques, New Age International Publishers, New Delhi.
3. Bajpai S. R., (1975), Methods of Social Survey and Research, Kitabghar, Kanpur.
4. Bhattacharya D. K., (2004), Research Methodology, New Delhi, Excel Books.
5. Brymann Alan and Carmer D., (1995), Qualitative data analysis for social / scientist, New York, Routledge publication.
6. Best J. W. and Khan J. V., (2005), Research in Education New Delhi, Prentice Hall India. Hans Raj (19gg) Theory and practice in Social Research, Surjeet publication, Kolhapur.
7. Chandera A. and Saxena T. P., (2000), Style Manual, New Delhi, Metropolitan Book Comp. Ltd.
8. Krishnaswami O. R., (1988), Methodology of Research in Social Science, Himalaya pub House.
9. Kothari, C. R., (2005), Quantitative Technique, New Delhi, Vikas publication House.
10. Gautam N. C., (2004), Development of Research tools, New Delhi, Shree Publishers.
11. Gupta, Santosh, (2005) Research Methodology and statistical Techniques, Deep and Deep publications.
1) Shukla J. J., (1999) Theories of Knowledge, Ahmadabad, Karnavati Publication

E-References:

1. https://www.slideshare.net/annakittystefen/researchmethodologymethodsandtechniquesbycrkothari
2. https://www.wisdomjobs.com/e-university/research-methodology-tutorial-355.html

Course Outcomes:

- Critically analyze research methodologies identified in existing literature.
- Choose appropriate quantitative or qualitative method to collect data.
- Propose and distinguish appropriate research designs and methodologies to apply to a specific research project.
- Develop a comprehensive research methodology for a research question.
- Apply the understanding of feasibility and practicality of research methodology for a proposed project.

2. Programming 2

Course Code	**CSI409**	**Course title**	**Programming 2**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

The Department has adopted the horizontal format for programming group which will help the students to become master regarding that programming group. Regarding 2018-19 the Department has selected the Java group.

Prerequisites:

- The student (s) should holds good skills on functional programming concepts, fundamental object oriented concepts.
- Student(s) should select wither group prior so that there are of expertise nurtured by the department by providing them training on the selected platform.
- Student(s) should have basic knowledge of core Java.

Course Objectives:

- Objective of this course is to provide the ability to design console based, GUI based and web based applications.
- Students will also be able to understand integrated development environment to create, debug and run multi-tier and enterprise-level applications.

Course Outline: Java Group (Advance Java)

Unit 1: Introduction to Advanced Java Programming: Overview of the Java Platform, A Brief History of the Java Platform, **Object:** Oriented Programming in Java, Standard SDK Tools, Classes and Objects, Using Constructors, Reference Objects and the Garbage Collector, Casting Between Types.

Unit 2: 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, Java Web Architecture, The Java Advantage for Web, Java EE Web Architecture Java Web Application Server.

Unit 3: GUI and Java Database Connectivity: Event handling, AWT Controls, Window forms and controls, Layout managers, Menus, Applet ,Java Database Connectivity Architecture, **JDBC:** ODBC Bridge, JDBC Drivers, JDBC API, Classification of JDBC classes, Driver Interface, Driver Manager Class, Connection, Statement, Result Set, Implementing Stored Procedures.

Unit 4: Java Servlets: Servlet Overview and Architecture, interface Servlet and Servlet Life Cycle,HandlingHTTP get Requests, Handling HTTP post Requests, Redirecting Requests to O ther Resources, Session Tracking, Cookies, Session Tracking with Http Session.

Unit 5: 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.

Reference Books:

1. Java 2 Complete Reference by Herbert Schieldt (Sixth Edition)
2. Advanced Java, Jambu Krishnamurthi, Comp-U Learn Inc.
3. Mastering Enterprise Java Beans 3.0, Rima Patel, Wiely Publication.
4. Java Server Pages for Beginners, Bayross and Shah, SPD
5. Java Servlet Programming, Jason Hunter, SPD (O'Reilly)

Web:

1. https://www.studytonight.com/java/
2. https://freevideolectures.com/course/3690/advanced-java
3. https://www.tutorialspoint.com/java/java_pdf_version.htm

Lab Exercise: CSI456 Practical based on CSI409:

1. Java Programs for revising basics.
2. Java Program for Multithreading
   2.1. Creating and running thread
   2.2. Multiple threads creation
   2.3. Communication between threads
3. Java Servlets:
   3.1. Write a simple servelet that just generates plain text.
   3.2. Program to display cookie ID
   3.3. Write a program to call one servlet by another servlet
4. Program for validation using servlet.
5. Java Beans: demonstrate use of beans, implementing beans.
6. JDBC: Write a database application that uses any JDBC driver.
7. Write a java program to perform JDBC operations like-insert, delete, update and view student's records.

Course Outcomes:

- It develops advanced Java programming skills that are required to fully utilize the capabilities of this object-oriented, general-purpose programming language.
- Explore programming techniques of Java beans and swing. Be aware about Java Enterprise applications, know about java servlets.

3. Relational Database Management System

Course Code	**CSI410**	**Course title**	**Relational Database Management System**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

Prerequisite: It is just assumed to have a familiarity with basic data structures, computer organization and any high level programming language.

Course Objective:

- To make the students aware of the basic knowledge of the relational database management which will include the aspects of database design, query languages and database system implementation.

Course Outline:

Unit 1: Overview of Database Concepts: Introduction, Basic Concepts, View of data, Data models, E-R diagrams, DBA, DB Users, Mapping Cardinalities, Keys, Database Languages, **Relational Model:** Structure of relational database models, Relational Algebra, Modification of database, Views, **SQL:** Background, Basic Structure, Different Operations, Functions, Queries, Relations, Views, **Indexing and Hashing:** Basic Concepts, Indexing, Types of Indexing, Hashing, B+, B- Trees, Static Hashing, Dynamic Hashing.

Unit 2: Relational Database Design: Functional Dependencies, Normalization, Types of Normalization, **Query Processing:** Overview, Transformation of relational expressions, evaluation of expressions, measures of query cost, architecture of query processing model, distributed query processing

Unit 3:Transactions: Concept, Transaction States, ACID property, Concept of Serializability, testing for serializability, analysis of different types of schedules like: conflict equivalent, conflict serializable, concept of conflict serializability, etc. **Concurrency Control:** Protocols for Concurrency control, Timestamp, Lock-based, granting of locks, two phase locking protocol, graph based protocol, etc, Concept pf multiple granularity, Deadlock handling.

Unit 4: Database Recovery: Failure Classification, Storage structure, recovery and atomicity, check points, types of recovery like, log based recovery, shadow paging etc. **Database System Architectures:** Centralized Systems, Client-Server systems, Parallel and distributed systems, Network types, **Distributed Databases:** Distributed data storage, data replication, data fragmentation.

Unit 5: New Applications: DSS, MIS, Data Mining, Data Warehousing, Types of Databases, New Trends in databases, Introduction to RDBMS: Concept, types, examples, applications.

Reference Books:

1. Silberschatz, Korth, & Sudarshan, Database System Concepts, 5th edition, McGraw-Hill (2005).
2. Elmasri & Navathe, Fundamentals of Database Systems.
3. Introduction to Database Systems, Bipin C. Desai
4. http://www.bell-labs.com/topic/books/db-book
5. www.mit.ocw.edu/

Lab Exercise: CSI457 Practical based on CSI410

At least two experiments should be carried out on each unit.

Course Outcomes: The course aims to give the students both the theoretical and practical foundation in Data Base Management Systems. Student will also learn advanced concepts as well as new trends in the field. This to course has two main objectives:

- Provide students with an understanding of the relational model, relational database design, and SQL.
- Students will construct SQL queries using SQL.
- To provide students with a working knowledge of the underlying architecture and implementation of modern database systems.
- Students will study different concepts like, Integrity Constraints, indexing methods, transaction management, query processing, etc.

4. Network Security

Course Code	**CSI411**	**Course title**	**Network Security**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

Prerequisite: Student must know basics of data communications, protocols, and concepts of computer networks

Course Objective: To learn various techniques to secure information while traveling through different communication mediums

Course Outline:
Unit 1: Overview, Classical Encryption Techniques, Block Ciphers.

Unit 2: Advanced Encryption Standard, Confidentiality Using Symmetric Encryption, Number Theory

Unit 3: Public- Key Cryptography and RSA, Public- Key Cryptosystems, Hash Algorithms

Unit 4: Digital Signatures, Authentication Applications, Electronic Mail Security

UNIT 5: Web Security, Intruders, Malicious Software, Firewalls

Book:
1. The official course text is Cryptography and Network Security: Principles and Practice; Second Edition . By William Stallings, Prentice Hall, Hardcover
2. Network Security Essentials: Applications and Standards by William Stallings. Prentice Hall, Hardcover, Published November 1999, 366 pages, ISBN 0130160938

References:
1. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press, hardcover.
2. Secrets and Lies: Digital Security in a Networked World by Bruce Schneier John Wiley, Published August 2000, 412 pages, ISBN 0471253111.
3. A Course in Number Theory and Cryptography (Graduate Texts in Mathematics),(Hardcover) by Neal Koblitz Number theory with computer applications, by Ramanjuachary Kumandari and Christina Romero (1998)
4. Get details of threats to information and system security. Discuss Virus, worms, Trojans etc in details.
5. Study any library for packet tearing and packet sniffing.
6. Implement Generic Cipher, Fiestal Cipher and DEC
7. Implement Packet Sniffing using the library studied in Assg No 2
8. Study of Firewall
9. Implementing firewall in Windows server/ Linux Server

Lab Exercise: CSI458 Practical based on CSI411:

At least two experiments should be carried out on each unit.

Course Outcomes: At the end of the course students should be able to:

- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.
- Compare and Contrast different IEEE standards and electronic mail security.

5. Fundamental of Compiler Design

Course Code	**CSI412**	**Course title**	**Fundamental of Compiler Design**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs/week**	**Total Contact Hours (Pr)**	**4 Hrs/Week**

Prerequisite: Good programming skills and ability to reason well.

Course Objective:

- To explore the principles, algorithms and data structures involved in the design and construction of compilers

Course Outline:

Unit 1: Introduction: Translation and Interpretation, tasks of compiler, Data management in compiler, compiler structure. **Properties of Programming Language:** Overviews, Syntax, Semantics and Pragmatics, Data Objects and operations, Expressions, control structures.

Unit 2: Properties of Real and Abstract Machine: Basic characteristics, representation of language elements, **Storage management:** static and dynamic storage management, mapping specifications, **Abstract Program Representations:** Intermediate language, Token sequence, structure tree, computation graph, target tree, Global tables, Symbol table, Constant table, Definition table.

Unit 3: Elements of Formal Systems : Lexical System, Module and interfaces, decomposition of grammar, lexical analyser and interface, construction, Extraction and representation, state minimization, Descriptive tools, Strings and rewriting grammars, grammars, derivation and parse tree, Regular Grammar and Finite Automata, Context free Grammar

Unit 4: Parsing : Design, Parser Interface, Selection of parsing algorithm, parser construction, top down and bottom up parsers, sentential forms, LR parser, general Shift reduce, SLR, LR(1), LR(k). LL (1) parser, Computation of FIRST and FOLLOW sets, Left Factoring, Left Recursion elimination, Operator Precedence Parsing

Unit 5: Code Optimization and Generation: Computation graph, local optimization, local optimization. Code generation, Memory Mapping, Target Attribution, Code Selection.

Reference Book:

1. Compiler Construction by William Waite and Gehard Googs

Online Book:

1. https://www.cs.cmu.edu/~aplatzer/course/Compilers/waitegoos.pdf

Lab Exercise: CSI459 Practical based on CSI412

At least two experiments should be carried out on each unit.

Course Outcomes:

- Fluency in describing the theory and practice of compilation, in particular, the lexical analysis, syntax, and semantic analysis, code generation and optimization phases of compilation.
- Ability to create lexical rules and grammars for a programming language

6. Elective 1

Course Code	**CSI481**	**Course title**	**Elective -1**
Number of Credits	**3 Credits**	**Internal / External**	**20/80**
Total Contact Hours (Th)	**3 Hrs /week**	**Total Contact Hours (Pr)**	**4 Hrs / Week**

The Department has adopted the horizontal format for elective group which will help the students to become master regarding that programming group. Regarding 2018-19 the Department has selected the Pattern Analysis Elective group.

Prerequisite: To learn this course basic knowledge of Digital Signal Processing, Mathematics and Statistical Techniques is must.

Course Objective:

- To introduce the student to various image processing techniques.

Course Outline: Digital Image Processing

Unit 1: Image Processing Fundamentals: Digital image, digital image processing, History of digital image processing, State of the art examples of digital image processing, Key stages in digital image processing, The human visual system, Light and the electromagnetic spectrum, Image representation, Image sensing and acquisition, Sampling, quantisation and resolution.

Unit 2: Image Enhancement (Histogram Processing, Point Processing and Spatial Filtering): image enhancement, Different kinds of image enhancement, Histogram processing, Point processing, Neighbourhood operations, Negative images, Thresholding, Logarithmic transformation, Power law transforms, Grey level slicing, Bit plane slicing, Neighbourhood operations, spatial filtering, Smoothing operations, Correlation and convolution, Sharpening filters, 1st derivative filters, 2nd derivative filters, Combining filtering techniques

Unit 3: Image Restoration (Noise Removal): image restoration, Noise and images, Noise models, Noise removal using spatial domain filtering, Periodic noise, Noise removal using frequency domain filtering,

Unit 4: Image Segmentation: Thresholding and thresholding algorithms, Performance evaluation and ROC analysis Connected components labeling, Region growing and region adjacency graph (RAG),Split and merge algorithms, Morphological algorithms, Erode and dilate as max and min operators on binary images Open, close, thinning and other transforms Medial axis transform Introduction to grey-level morphology

Unit 5: Color Image Processing : Fundamentals of colour image processing, Secondary colours, Colour Image Models, Basics of full colour image , Pesudo-color image processing, Colour Image Segmentation.

Book:

1. Digital Image Processing, 3/e, Rafael C. Gonzalez, Richard E. Woods. Pearson Education, ISBN: 9788131726952

Reference Books:

1. S. Sridhar "Digital Image Processing", Oxford Publishers, 2011.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar Digital Image Processing", McGraw Hill Publishers, 2009.
3. Chanda and D. Dutta Majumdar "Digital Image Processing and Analysis", Prantice Hall of India.
4. Anil K. Jain "Fundamentals of Digital Image Processing", Prantice Hall of India, 2012.
5. Milan Sonka, Hlavac & Boyel, "Digital Image Processing and Computer Vision", Cengage Learning Publishers, 2010.

E-book:

1. Digital Image Processing, 3/e, Rafael C. Gonzalez, Richard E. Woods. Pearson Education, ISBN: 9788131726952

Lab Exercise: CSI460 Practical based on CSI481:

At least two experiments should be carried out on each unit.

1. Viewing digital images, bits and bytes, raster scan format, quantization
2. Scaling, translation and rotation, sums and differences
3. Histograms and stretches, convolutional filters
4. Fourier transforms and the frequency domain, filters
5. FFTs, Image filtering: smoothing and sharpening
6. 2D convolution and correlation
7. Application of above algorithms for Brain Tumar detection, character detection, etc.

Course Outcome:

- At the completion of course the student have preliminary knowledge about Digital Image Processing.

IQAC Cell

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

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