



Dr. Babasaheb Ambedkar Marathwada Univeristy

Aurangabad

Department of Computer Science & Information Technology

Reaccredited with 'A' Grade

CURRICULUM BOOK

M.SC. INFORMATION TECHNOLOGY

2016-2018

OBE Curriculum with w.e.f. Academic Year 2017-2018



**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, 2016-18

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**Dr. Babasaheb Ambedkar Marathwada University, Aurangabad**  
Department of Computer Science and Information Technology

**Choice Based Credit System**  
**M.Sc. Information Technology**  
**(2016-2018)**

**SCHEME FOR CHOICE BASED CREDIT SYSTEM (CBCS)**  
**w.e.f. JUNE, 2016 (ACADEMIC YEAR, 2016-18 Onwards)**

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### **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.

Masters programs offered by the Department

1. M. Sc. Computer Science
2. M. Sc. Information Technology
3. M. Phil. Computer Science

## **Admission/ Promotion in M.Sc. Information Technology Program: M. Sc. Information Technology**

**Duration:** (Four Semesters means Two Academic Years)

**Intake:** 32

### **Eligibility:**

- i) B.Sc. Computer Science OR B.Sc. IT OR B. Sc. Computer Application OR B.E/B. Tech. in Computer Science and Engineering/IT.OR
- ii) Any Science Graduate with at least one Optional Subject as Computer Science.

**Program Outcomes:** The overall objective of this course is to cater the need of computational field. The content of this course is according to the current trends of research in Computer Science and requirements of industry expectations. Some courses of this program are exclusively designed towards development of analytical, presentation and personality development skills among the students, through which the students get prepared and trend for building their carrier in computer science and its related applied technology, research and development.

In line with Outcome based education the program specific outcomes for M.Sc. Computer Science programs are as follows

- To be fundamentally strong at core subjects of computer science.
- An ability to apply programming and computational skills for industrial solutions.
- Realizes the importance of lifelong learning and continuous professional development.
- Broad understanding of latest technological trends.
- An ability to identify opportunities for establishing an enterprise for immediate Employment.
- Ability to understand and apply fundamental research concepts.
- An ability to use efficient soft skills for professional development.
- To be rational in professional ethics and attitude.
- Able to use current tools and technologies to cater multidisciplinary needs.
- An ability to indulge in lifelong learning for professional development.
- Ability to sustain in the areas of Data Science and Analytics.

## Fees

**The fees structure for the course M.Sc. Information Technology per year is:**

Total Fees	Rs. 15,000*/ Year
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**\*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. According to the need of the student department may arrange/schedule the bridge course at the begging of semester.
- (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:

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

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:

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

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 IV<sup>th</sup> Semester).

### **Cumulative Grade Card**

At the end of the IV<sup>th</sup> 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 CG PA and total credits earned.

## Course Structure of M. Sc. [Information Technology]

w.e.f. (Academic Year 2016-18)

Course Code	Course Title	Semester-I		Total Marks	
		No. of Credits	No. of Hrs./Week	Internal	External
CSI401	Constitution of India	2	2	10	40
CSI402	Research Methodology	2	2	10	40
CSI403	Programming Core Java	3	3	20	80
CSI404	Computer System Architecture	3	3	20	80
CSI405	Operating System	3	3	20	80
CSI406	Information Theory	3	3	20	80
CSI451	Practical based on CSI403	2	4	-	50
CSI452	Practical based on CSI404	2	4	-	50
CSI453	Practical based on CSI 405	2	4	-	50
CSI454	Practical based on CSI406	2	4	-	50
Total No. of Credits		24	-	-	-

Course Code	Course Title	Semester-II		Total Marks	
		No. of Credits	No. of Hrs./Week	Internal	External
CSI407	Research Project Review Writing	1	1	25	-
CSI408	Interactive Programming using Python	3	3	20	80
CSI409	Software Engineering and CASE Tools	3	3	20	80
CSI410	Data Structure	3	3	20	80
CSI411	Computer Network	3	3	20	80
CSI412	Relational Database Management System using MySQL	3	3	20	80
CSI455	Practical based on CSI408	2	4	-	50
CSI456	Practical based on CSI409	2	4	-	50
CSI457	Practical based on CSI 410	2	4	-	50
CSI458	Practical based on CSI411	2	4	-	50
CSI459	Practical based on CSI412	2	4	-	50
Total No. of Credits		26	-	-	-

Semester-III				Total Marks	
Course Code	Course Title	No. of Credits	No. of Hrs./Week	Internal	External
CSI501	Advanced Programming Using Python	3	3	20	80
CSI502	Data Warehousing Using MySQL	3	3	20	80
-	Elective –I (Generic)	3	3	20	80
CSI551	Project/Dissertation Part –I	12	24	100	200
CSI552	Practical based on CSI501	2	4	-	50
CSI553	Practical based on CSI 502	2	4	-	50
-	Practical based on Elective-I	2	4	-	50
Total No. of Credits		27	-	-	-

Semester-IV				Total Marks	
Course Code	Course Title	No. of Credits	No. of Hrs./Week	Internal	External
CSI503	Data Mining	3	3	20	80
-	Elective –II (Discipline Centric)	3	3	20	80
CSI554	Project/Dissertation Part -II	12	24	100	200
CSI555	Seminars	1	2	-	25
-	Service Course	3	3	20	80
CSI556	Practical based on CSI503	2	4	-	50
-	Practical based on Elective-II	2	4	-	50
Total No. of Credits		26	-	-	-

Elective-I				Total Marks	
Course Code	Course Title	No. of Credits	No. of Hrs./Week	Internal	External
CSI521	Remote Sensing	3	3	20	80
CSI522	Image Processing	3	3	20	80
CSI523	Cyber Law & Cyber Crime	3	3	20	80
CSI524	Network Security	3	3	20	80
CSI525	Cloud Computing	3	3	20	80
CSI526	Mobile Computing	3	3	20	80
CSI527	ERP	3	3	20	80
CSI557	Practical Based on CSI521	2	4	-	50
CSI558	Practical Based on CSI522	2	4	-	50
CSI559	Practical Based on CSI523	2	4	-	50
CSI560	Practical Based on CSI524	2	4	-	50
CSI561	Practical Based on CSI525	2	4	-	50
CSI562	Practical Based on CSI526	2	4	-	50
CSI563	Practical Based on CSI527	2	4	-	50

Course Code	Elective-II Course Title	No. of Credits	No. of Hrs./Week	Total Marks	
				Internal	External
CSI528	Programming J2ME	3	3	20	80
CSI529	Open Source Web Programming Using PHP	3	3	20	80
CSI530	VB.Net Using My SQL	3	3	20	80
CSI531	GIS	3	3	20	80
CSI532	Biometrics	3	3	20	80
CSI533	Android Programming	3	3	20	80
CSI534	Human Computer Interaction	3	3	20	80
CSI564	Practical Based on CSI528	2	4	-	50
CSI565	Practical Based on CSI529	2	4	-	50
CSI566	Practical Based on CSI530	2	4	-	50
CSI567	Practical Based on CSI531	2	4	-	50
CSI568	Practical Based on CSI532	2	4	-	50
CSI569	Practical Based on CSI533	2	4	-	50
CSI570	Practical Based on CSI534	2	4	-	50

**Total (I+II+III+IV) Semester (24+26+27+26) Credits = 103**

### Service Courses:

The student should opt service course of 4 credits either from parent department or from other department.

Course Code	Service Courses Course Title	No. of Credits	No. of Hrs./Week	Total Marks	
				Internal	External
CSC541	Communication Skills	4	4	20	80
CSC542	Introduction to MATLAB	4	4	20	80
CSC543	Web Developments	4	4	20	80
CSC544	Personality Development	4	4	20	80
CSC545	Aptitude Development	4	4	20	80
CSC546	Android Programming	4	4	20	80
CSC547	Intellectual Property Rights	4	4	20	80

## Detailed Syllabus

### Semester – I

#### 1. Constitution of India

<b>Course Code</b>	<b>CSI401</b>	<b>Course Title</b>	<b>Constitution of India</b>
<b>Number of Credits</b>	<b>2 Credits (TH)</b>	<b>Internal</b>	<b>10%</b>
<b>Total Contact Hours</b>	<b>2 Hrs. (TH/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>40%</b>

**Prerequisite:** There is no prerequisite for the course

#### Course Objectives

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

#### Course Outline:

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

**Unit II:** Philosophy of the Indian Constitution: Preamble, Salient Features.

**Unit III:** 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 IV:** 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

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<b>Course Code</b>	<b>CSI402</b>	<b>Course Title</b>	<b>Research Methodology</b>
<b>Number of Credits</b>	<b>2 Credits (TH)</b>	<b>Internal</b>	<b>10%</b>
<b>Total Contact Hours</b>	<b>2 Hrs. (TH/Week)</b>	<b>External</b>	<b>40%</b>
		<b>(Semester/Term Exam)</b>	

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**Prerequisite:** There are no mandatory prerequisites for this course however the student should be able to identify the problem in respective domain.

### Course Objectives:

Following are the objectives of the course

1. Foundations and principals behind engaging research are inculcated.
2. 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.  
**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: 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 3: 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 4: Methods & tools of data collection:** Concept of sampling and other concepts related to sampling. Probability and nonprobability 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 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. **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.



**Reference Books:**

1. Bajpai S. R., (1975), Methods of Social Survey and Research, Kitabghar, Kanpur.
2. Bhattacharya D. K., (2004), Research Methodology, New Delhi, Excel Books.
3. Brymann Alan and Carmer D., (1995), Qualitative data analysis for social / scientist, New York, Routledge publication.
4. 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.
5. Chandra A. and Saxena T. P., (2000), Style Manual, New Delhi, Metropolitan Book Comp. Ltd.
6. Krishnaswami O. R., (1988), Methodology of Research in Social Science, Himalaya pub. House.
7. Kothari, C. R., (2005), Quantitative Technique, New Delhi, Vikas publication House.
8. Gautam N. C., (2004), Development of Research tools, New Delhi, Shree Publishers.
9. Gupta, Santosh, (2005) Research Methodology and statistical Techniques, Deep and Deep publications.
10. Shukla J. J., (1999) Theories of Knowledge, Ahmadabad, Karnavati Publication.

**Course Outcomes:**

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

### 3. Programming in Core Java

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Course Code	CSI403	Course Title	Programming in Core Java
Number of Credits	3 Credits (TH) 2 Credits (PR)	Internal	20%
Total Contact Hours	3 Hrs. (TH/Week) 4 Hrs. (PR/Week)	External (Semester/Term Exam)	80%

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#### Prerequisites:

Before attending this course, students must have:

- The student should know the Object-oriented programming Concepts
- Understanding of the basics of structured programming, including concepts such as flow control, variables, and parameters, and function calls

#### Course Objectives:

1. Programming is the most core component of Computer Science.
2. Other aspects of the subject are specializations or Master hands-on core programming JAVA.
3. Therefore the course provides to students with the knowledge and skills needed to develop applications in Java using Open source platform.
4. The course focuses on fundamental concepts, designing user interfaces, program structure, language syntax, and implementation details.
5. This is the first course in the Java Certification Exam and will serve as the entry point for other Advance Java Courses.
6. This Course can step back and consider more generally how we can organize the process of writing computer programs.
7. We can develop mathematics to help us describe and analyses the behavior of computer programs.
8. We can look at some of the common application.

#### Course Outline:

**Unit-1: Java Introduction:** The Java Environment – Overview, Writing a Java Program, Obtaining The Java Environment, Setting up your Java Environment, Creating a Class That Can Run as a Program, The main() Method, Useful Stuff Necessary to go Further, System.out.println (), Using the Java Documentation, **Java Basics:** Basic Java Syntax: General Syntax Rules, Java Statements, Blocks of Code, Comments, **Variables:** Data types, Primitive Data Types, Object Data Types, Literal Values, Constants and the final keyword, **Mathematics in Java:** Expressions, Operator Precedence, Multiple Assignments, Order of Evaluation, Bitwise operators, Compound Operators, **Expressions that Mix Data Types:** Typecasting Creating and Using Methods, Creating Methods, Variable Scope

**Unit-2: Java Objects:** Objects: Object- Oriented Languages, Object- Oriented Programs, Encapsulation, Creating and Using an Instance of an Object, References Defining a Class, Constructors, Method Overloading, The this Keyword, static Elements, Garbage Collection, Java Packages, Dealing with Keyboard Input, String, String Buffer, and String Builder, Creating Documentation, Comments and Using javadoc, Javadoc Comments **Comparisons and Flow Control Structures:** Controlling Program Flow: Boolean- Valued Expressions, Complex Boolean

Expressions, Simple Branching, Two Mutually Exclusive Branches, Nested if...else Statements- Comparing a Number of Mutually Exclusive Options, Comparing a Number of Mutually Exclusive Options-The switch Statement, Comparing Objects, Conditional Expression, while and do. . .while Loops, for Loops, Additional Loop Control: break and continue, Breaking Out of a Loop, Continuing a Loop, Class path, Code Libraries, and JAR files, Using CLASSPATH Creating a jar File (a Library) **Arrays and Vectors:** Arrays : Defining and Declaring Arrays, Instantiating Arrays, Initializing Arrays, Working With Arrays, Array Variables, Copying Arrays, Arrays of Objects, Enhanced for Loops - the For- Each Loop, Multi- Dimensional Arrays, Multidimensional Arrays in Memory, Example - Printing a Picture, Typecasting with Arrays of Primitives, Using Vectors: Defining Vectors and using Vectors.

**Unit-3: Inheritance:** Derived Class Objects, Polymorphism, Inheritance and References Dynamic Method Invocation, Creating a Derived Class, Inheritance and Access Inheritance and Constructors the super Keyword, Derived Class Methods That Override Base Class Methods Inheritance and Default Base Class Constructors, The Instantiation Process at Runtime, **Typecasting with Object References:** Typecasting, Polymorphism, and Dynamic Method Invocation, More on Overriding, Object Typecasting Example, **Checking an Object's Type:** Using instance of, Typecasting with Arrays of Objects, Other Inheritance- Related Keywords: abstract, final, Methods Inherited from Object **Packages and Interfaces:** Interfaces: Creating an Interface Definition, Implementing Interfaces: Implementing Interfaces – Example, Reference Variables and Interfaces, Calling an Interface Method, Interfaces and Inheritance: Some Uses for Interfaces, Interfaces and Event-Handling Interfaces and "Pluggable Components", Packages: Creating and using packages, Access C. Inner Classes: Inner Classes, Nested Classes, Inner Class Syntax, Instantiating an Inner Class Instance from Within the Enclosing Class, Inner Classes Referenced from Outside the Enclosing Class Working with Inner Classes **Exceptions:** Exceptions: Handling Exceptions, Exception Objects: Attempting Risky Code try and catch, Guaranteeing Execution of Code the finally Block, Letting an Exception be Thrown to the Method Caller, Throwing an Exception, Exceptions and Inheritance, Exception Class, Constructors and Methods, Creating and Using Your Own Exception Classes, Rethrowing Exceptions,\_INITIALIZER Blocks, Static\_INITIALIZER Blocks, Assertions.

**Unit-4: Utility Classes:** Collection Interfaces, Concrete collections, Collections framework, Algorithms, Legacy Collections Streams: Output Streams, Input Streams, Filter Streams, Readers and Writers **Threads:** Thread Class and Runnable Interface, Thread Synchronization. I/O Package: InputStream and OutputStream classes, Reader and Writer classes. **Java Networking:** InetAddress, URL, URLConnection, TCP/IP Server Socket, Client Socket, User Datagram Sockets. **Applet and Swings:** Applet: Applet Life Cycle, Passing Parameters to Applet, Delegation Event Model, AWT Components, AWT Events, using listeners, Working with Graphics, Loading Image and Multimedia objects in applet

**Unit-5: Java Database Connectivity:** Java Database Connectivity Architecture, JDBC-ODBC Bridge, JDBC Drivers, JDBC API, Classification of JDBC classes, Driver Interface, DriverManager Class, Connection, Statement, ResultSet, Implementing Stored Procedures.

#### Reference Books:

1. Java 2 Complete Reference by Herbert Schildt (Sixth Edition)
2. Core Java Vol 1: Sun Press, Eighth Edition
3. Core Java Vol 2: Sun Press

**E-book:**

1. Java 2 Complete Reference by Herbert Schildt (Fourth Edition)

**Lab Exercise: CSI451 Practical based on CSI403:**

There should be minimum 10 lab assignment on the topics discussed in the course.

**Course Outcomes:**

- The course provides students with the knowledge and skills needed to develop applications in Java for the Microsoft and sun platform.
- The course focuses on fundamental concepts, designing user interfaces, program structure, language syntax, and implementation details.
- The students will be able to understand and apply the knowledge for development of Applets and Apps Development.
- Create a simple Java Application based on the Java Foundations.
- Use of Java forms and controls to create a user interface.
- Create and use variables and arrays.
- Create and use Class, Interfaces, Packages and predefined utility classes.
- Implement decision structures and loops by using conditional expressions.
- Validate user input for fields, controls, and forms.
- Apply object-oriented programming techniques to create classes, add methods and add behavior to the classes Resolve syntax, run-time, and logic errors by using the structured exception handling.
- Enhance the user interface by adding menus, status bars, and toolbars.

## 4. Computer System Architecture

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<b>Course Code</b>	<b>CSI404</b>	<b>Course Title Computer System Architecture</b>	
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20%</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80%</b>

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**Prerequisite:** Student must aware of basics of digital electronics, microprocessor architecture, ALP.

### Course Objectives:

1. To study the basic working and organization of various components of computer systems.
2. To have a thorough understanding of the basic structure and operation of a digital computer.
3. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
4. To study the different ways of communicating with I/O devices and standard I/O interfaces.
5. To study the hierarchical memory system including cache memories and virtual memory.

### Course Outline:

**Unit-1:** Data Representation: Introduction, Data types, Complements, Fixed Point and Floating Point representation, Error Detecting Codes.

**Unit-2:** Digital Logic Circuits: Digital Computers, Logic Gates, Boolean algebra, Map Simplification, Combinational Circuits, Flip- Flops Sequential Circuits.

**Unit-3:** Digital Components: Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Unit.

**Unit-4:** Central Processing Unit: Introduction, general Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

**Unit-5:** I/O& Memory Organization: Peripheral Devices, Input Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access, Input- Output Processor, and Serial Communication, Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

### Reference Books:

1. Computer System Architecture- M. Morris Mano, PHI Publication, ISBN- 81- 203- 0855- 7. 3rd Ed.
2. Computer Organization and Architecture- William Stallings – Fifth Edition.
3. Structured Computer Education – Andrew S Tanenbaum- (Prentice Hall)- Fourth Edition.

### E-Book:

1. [http://www.tutorialspoint.com/computer\\_logical\\_organization/](http://www.tutorialspoint.com/computer_logical_organization/)

**Lab Exercise: CSI452 Practical based on CSI404:**

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

**Course Outcomes:**

- After completion of this course students will be able to understand and able to design circuit and simplify it. Will be able to understand in detail the how logic systems are built.
- Students will have thorough knowledge about Basic structure of a digital computer Arithmetic operations of binary number system the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

## 5. Operating System

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<b>Course Code</b>	<b>CSI405</b>	<b>Course Title</b>	<b>Operating System</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** Student must know Computer System Architecture in order to understand functioning of Operating system and must have knowledge of disk operating systems.

### Course Objectives:

1. This course introduces basic issues in operating systems.
2. Topics include Threads, processes, concurrency, memory management, I/O Control and case studies.
3. Hands-on study of Linux operating system design and kernel internals.

### Course Outline

**Unit - 1: Introduction:** Definition of OS, Types of OS: main Frame, Desktop, Multiprocessor, Distributed, Clustered, Real time, Multiprogramming, Time Sharing, Embedded OS. Overview of operating systems responsibilities. Operating system components and structures. Desirable Qualities of OS. Process: Definition Processes and programs. Implicit and Explicit tasking, Independent and Co-operation process, Process relationship, Process States, Process State transitions, Process Control Block, Context switches, Threads: Necessity and Advantage of Threads, Types of Threads. System Calls and System call Execution. **Thread programming using OpenMP:** OpenMP programming model, Specifying current task in OpenMP, Synchronization Constructs in OpenMP, Data Handling, Library function, Environment variables. Process Scheduling: Objectives of scheduling, **Types of Schedulers:** Short, Long, Medium, Comparison between schedulers, Scheduling Criteria, **Scheduling Algorithms:** Types Preemptive and Non-Preemptive scheduling, FCFS, RR, SJF and Priority based Scheduling; Evaluation of Scheduling algorithms.

**Unit - 2: Interposes Communication:** Basic concepts, Shared Memory System, Message Passing: Direct versus Indirect Communication, Critical Sections, Race conditions, Mutual Exclusion. **Semaphores:** Definition, WAIT(S) and SIGNAL(S) instructions, Algorithm for WAIT and SIGNAL operations, Locks, Monitors and Condition variables. **Deadlocks:** Definition, Characteristics, A resource Allocation graph, Deadlock prevention, Deadlock avoidance: Banker's Algorithm, Deadlock Detection and Recovery.

**Unit - 3: Introduction:** Overlays and Swapping, Logical and Physical address space, Contiguous allocation methods, Single partition and multiple partition Systems, Relocation Memory Management. **Paging:** Principle of operation, Page allocation, Hardware support for paging, Paging address translation by direct mapping and associate mapping, Protection and sharing, Advantages and disadvantages of paging. **Segmentation:** Principle of operation, Address translation, Advantages and disadvantages of segmentation, Comparison between segmentation and Paging. **Virtual Memory:** Necessity, Hardware and control structures, Locality of reference, Page fault, Working set, Dirty page/Dirty bit, Demand paging, Thrashing, Page replacement Policies: FIFO, LRU, NRU.

**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. **ShellScripts:** Creating and executing simple shell programs, variables, special characters, comparison of expressions, iteration statements, conditional statements functions. **System Administration:** Installing Linux, Booting the system, Maintaining user accounts, File systems and Special Files, Backups and Restoration.

**Book:**

1. 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, 3rd edition, Andrew S. Tanenbaum; Prentice Hall, ISBN-10: 0-13-600663-9, 2008.
3. Using OpenMP, Portable Shared Memory Parallel Programming ,Barbara Chapman, Gabriele Jost and Ruud van der Pas , 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](http://www.compunity.org/training/tutorials/3%20Overview_OpenMP.pdf)

**Lab Exercise: CSI453 Practical based on CSI405:**

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

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



6. Thread synchronization using counting semaphores and mutual exclusion using mutex. Application to demonstrate: producer consumer problem with counting semaphores and mutex.
7. Deadlock Avoidance Using Semaphores
8. 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.
9. Demonstrate the following CPU Scheduling Algorithms
10. a. FCFS      b. SJF   c. Priority   d. Round Robin
11. Demonstrate all Page Replacement Algorithms a. FIFO      b. LRU   c. MRU
12. Simulate Bankers algorithm for Deadlock Avoidance
13. Simulate Bankers Algorithm for deadlock Prevention

**Course Outcomes:**

- 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

## 6. Information Theory

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<b>Course Code</b>	<b>CSI406</b>	<b>Course Title</b>	<b>Information Theory</b>
<b>Number of Credits</b>	<b>3 Credits (TH)</b> <b>2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week)</b> <b>4 Hrs. (PR/Week)</b>	<b>External</b> <b>(Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** The students should have the basic knowledge of networking and Matlab for implementation of practicals.

### Course Objectives:

1. Information Theory provides the fundamental backbone of reliable communications, reliable data storage, and data compression.
2. This subject provides the rigorous basis of 'information', showing it to have deep links to randomness, the ability to reduce data to its essence, and to the ultimate limits to communication.

### Course Outline:

**Unit 1: Information Theory:** Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source.

**Unit 2: Source Coding:** Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. **Fundamental Limits on Performance:** Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity.

**Unit 3:** Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem. **Introduction to Error Control Coding:** Introduction, Types of errors, examples, Types of codes. **Linear Block Codes:** Matrix description, Error detection and correction, Standard arrays and table look up for decoding.

**Unit 4:** Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.

**Unit 5:** Convolution Codes, Time domain approach. Transform domain approach.

### Text Books:

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley, 1996.
2. Digital communication, Simon Haykin, John Wiley, 2003.

**Reference Books:**

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 200

**Course Outcomes:**

- The students will be able to understand and apply fundamental concepts in information theory such as probability, entropy, information content and their inter-relationships.
- Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
- Describe the real life applications based on the fundamental theory.
- Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and soon.
- Implement the encoder and decoder of one block code or convolutional code using any program language.

## Semester – II

### 1. Research Project Review Writing

Course Code	CSC407	Course Title	Research Project Review Writing
No of Credits	1 Credits (TH)	Internal	100%
Total Contact Hrs./Week	1 Hrs. (TH/Week)	External (Semester end Exam.)	-

**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 collaboratively and individually to research to analyze and to write about public debates regarding the conduct of science & technology

#### Course Outline:

**Unit 1: What is a literature review:** The ability to review, and to report on relevant literature is a key academic skill? **A literature review:** situates your research focus within the context of the wider academic community in your field; reports your critical review of the relevant literature; and identifies a gap within that literature that your research will attempt to address.

**Unit 2:** Need a literature review, A critical review, Published work's Concepts Explanation and its Associated critique, Interpretation, Synthesis. Getting started Reading anything on your research area is a good start, What is the specific thesis, problem, or research question that my literature review helps to define, type of literature review am I conducting, Methodology, Policy, Quantitative research, Qualitative research , scope of my literature review.

**Unit 3: Ways of finding relevant material:** Electronic sources. References of references Hand searching of journals, Collecting material , Keeping a record , Plagiarism Detection .

**Unit 4:** Writing it up the task of shaping a logical and effective report of a literature review is undeniably challenging. Some useful guidance on how to approach the writing up is given by Wellington et al (2005:87): "It should be framed by your research questions. It must relate to your study. It must be clear to the reader where it is going: keep signposting along the way. Wherever possible, use original source material rather than summaries or reviews by others.

**Unit 5:** Using tables using tables to display numerical data, tables can be useful within a literature review when you are comparing other kinds of material. Reference list format and importance.

**Reference Books:**

1. Ask Oxford (2006). Found at: <http://www.askoxford.com/>
2. Murray, R. 2003: How to survive your viva. Maidenhead: Open University Press.
3. Rugg, G. & Petre, M. 2004: The unwritten rules of PhD research. Maidenhead: Open University Press.
4. Tinkler, P. & Jackson, C. 2004: The doctoral examination process: a handbook for students, examiners and supervisors. The Society for Research into Higher Education. Maidenhead: Open University Press.
5. Wellington, J., Bathmaker, A., Hunt, C., McCulloch, G. & Sikes, P. 2005: Succeeding with your doctorate. London: Sage.

**Course Outcomes:**

- With this course, students will become familiar with and learn to identify the most relevant textbooks, reviews, papers and journals for their research topics.
- During the course the students will also learn how to critically read and assess research papers and reviews.
- The review should point to research gaps that can be operational zed into feasible research questions.

## 2. Interactive Programming using Python

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<b>Course Code</b>	<b>CSI408</b>	<b>Course Title</b>	<b>Interactive Programming using Python</b>
<b>Number of Credits</b>	<b>3 Credits (TH), 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80%</b>

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**Prerequisite:** Student should possess basic programming skills. Exposure with C++, Java was preferred.

### Course Objectives:

1. This course will provide a gentle, yet intense, introduction to programming using Python for highly motivated students with little or no prior experience in programming.
2. The course will focus on planning and organizing programs, as well as the grammar of the Python programming language.

### Course Outline:

**Unit1: Getting started with python:** Python features, python environment, configuration and installation, python interpreter, interactive mode. Data types and Operations: Core data types, Numbers, Strings, Lists, Dictionaries, Tuples, files and others.

**Unit 2: Statement and Syntax:** python statements, assignments, expression and prints, conditional statements if, multi way branching, Looping Controls: while, for, loop coding techniques, Iterations and Comprehension. Iterators, Lists Comprehension, Range iterators, the map, zip and filter iterators, multiple vs single iterator, generators, timing iterators. Functions: scope, arguments, types of functions, recursion, function objects, anonymous function, Modules

**Unit 3: Exception Handling:** exceptions, default exception handler, catching exception, raising exception, user defined exceptions, termination action. Exception coding details: try/except/else statement, try statement, try else clause, try/finally statement, unified try/except/finally statement, raise statement, assert statement. Exception Objects: exception hierarchy, built-in exceptions, nesting exceptions, designing exceptions.

**Unit 4: Classes and OOP:** class statement, constructors and expressions, methods, Inheritance, Multiple inheritance (Is-a, Has-a), static, decorators, meta classes, Namespaces. Operator overloading: indexing and slicing, memberships, attribute reference. Delegation, Extending Built-in types, User Defined Modules.

**Unit 5: Wrappers in Python:** Reflections, Is instance, Duck typing, callable, Dir, Getattr, Regular expression: overview, matching and searching, replacing, splitting, escaping, flags, pattern objects.

### Reference Book:

1. Learning Python, 5th Edition, powerful Object-Oriented Programming, By Mark Lutz, and Publisher: O'Reilly Media, Final Release Date: June 2013

**E-books:**

1. Python Book  
([http://upload.wikimedia.org/wikipedia/commons/9/91/Python\\_Programming.pdf](http://upload.wikimedia.org/wikipedia/commons/9/91/Python_Programming.pdf))
2. <http://pythonbooks.revolunet.com/>

**Lab Exercise: CSI455 Practical based on CSI408:**

There will be minimum 10 programs on the entire content of the course. Students have to undertake a mini-project based on the concept learned under this course.

**Course Outcomes:**

- Student will be able to work with python. Students will be able to enrich their skills to deal with different python flavors for variety of applications.
- Understand the fundamental difference between existing / used / learned /awarded object oriented mechanism with Python architecture.
- Understand mechanism of handling error and writing user defined exception for customized user applications using python.
- Use power of additional libraries compatible with python, also develop user defined python library in the context of user defined application in python

### 3. Software Engineering and CASE Tools

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<b>Course Code</b>	<b>CSI409</b>	<b>Course Title</b>	<b>Software Engineering and CASE Tools</b>
<b>Number of Credits</b>	<b>3 Credits (TH)</b> <b>2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week)</b> <b>4 Hrs. (PR/Week)</b>	<b>External</b> <b>(Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** Basic understanding of software development process.

#### **Course Objective:**

1. In the theoretical part, students will learn about the principles and methods of software engineering, including current and emerging software engineering practices and support tools.
2. In the practical part, students will become familiar with the development of software products from an industry perspective, including generation of appropriate documents, under tight schedules and limited resources.

#### **Course Outline:**

**Unit 1:** The Nature of Software, Defining Software, Legacy Software, Software Engineering, Software characteristics, Application software. Software myths, Software engineering-A layered technology, A process framework, waterfall model, incremental and evolutionary models. Requirement engineering: Requirement engineering task, initiating the requirement engineering process, eliciting requirements, developing use cases, building analysis model, Negotiating requirements, validating requirements, data modeling, functional modeling and behavioral modeling. Requirements Specification: Characteristics of an SRS, Components of an SRS, Specification Languages, Structure of a requirements document.

**Unit 2:** Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model. **Architectural Design:** Software Architecture, Architectural Genres, Architectural Styles Architectural Design, Assessing Alternative Architectural Designs. **Component Level Design:** Designing Class-Based Components Conducting Component-Level Design, Cohesion and Coupling. **User Interface Design:** The Golden Rules, Interface Analysis and Design, Interface Analysis Interface Design Steps.

**Unit 3:** Verification and Validation, **Testing Overview:** Verification vs Validation, Design of test cases Black- Box testing: Equivalence Class Partitioning, Graph based testing Boundary Value analysis White- Box Testing: Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage, Cyclomatic Complexity Metric Data Flow- Based Testing. **Integration Testing:** Top down Testing, Bottom Up testing, Regression Testing, fazed vs Incremental Integration testing Systems Testing: Stress Testing Recovery Testing Security Testing. Debugging Techniques, Approaches, Tools.

**Unit 4:** Project Management Concepts, Process and project metrics, Process Metrics and Software Process Improvement, Project Metrics, Software Measurement, Size-Oriented Metrics, Function-Oriented Metrics, Object-Oriented Metrics, Use-Case-Oriented Metrics. **Project Planning Process:** Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Scheduling, Risk analysis, monitoring and management. Software



Configuration Management, Quality Management.

**Unit 5:** Clean room Software Engineering, Web Engineering, Software Reengineering, Reverse Engineering, Forward Engineering, Computer Aided Software Engineering.

**Books:**

1. Software Engineering – A Practitioners Approach Roger S. Pressman, 4th /7th Edition, Tata McGraw Hill, International Education.
2. An Integrated Approach To S/w Engineering, Pankaj Jolote, 1st / 2nd Edition, Narosa.
3. Software Engineering – A Programming Approach, D. Belie I. Moray, J. Rough, PHI.

**Reference Books:**

1. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons
2. K. K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001

**E-book:**

- Software Engineering – A Practitioners Approach Roger S. Pressman, 5th Edition, Tata McGraw Hill, International Education.

**Lab Exercise: CSI456 Practical based on CSI409:**

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

**Course Outcomes:**

1. Student should be able to understand the basic and advance concepts of software Engineering. The students should be able to apply these to real time projects in software development.
2. Plan and deliver an effective software engineering process, based on knowledge of widely used development lifecycle models.
3. Employ group working skills including general organization, planning and time management and inter-group negotiation.
4. Translate a requirements specification into an implementable design, following a structured and organized process.
5. Formulate a testing strategy for a software system, employing techniques such as unit testing, test driven development and functional testing.
6. Evaluate the quality of the requirements, analysis and design work done during the module.

## 4. Data Structure

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<b>Course Code</b>	<b>CSI410</b>	<b>Course Title</b>	<b>Data Structure</b>
<b>Number of Credits</b>	<b>3 Credits (TH)</b> <b>2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week)</b> <b>4 Hrs. (PR/Week)</b>	<b>External</b> <b>(Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** Before attending this course, students must have introductory concepts of like set theory, principles of programming languages, Introductory Object oriented programming paradigm.

### Course Objectives:

1. 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.
2. The course covers fundamental data structures, including lists, stacks, queues, trees, and graphs etc.

### Course Outline:

**Unit 1: Introduction:** Need of Data structures and Algorithms, Writing Algorithms, Testing Algorithms using Hand runs, Building Algorithms, Data Structures types like Linear, Non Linear, and Abstract Data Types, Data Structure operations.

**Unit 2: Design and Analysis Techniques:** Dynamic Programming:- Elements of Dynamic Programming, Matrix Multiplication, Longest Common Subsequence Problem, Introduction to Greedy Algorithms, Amortized Analysis Methods, time and Space Complexity of Algorithm.

**Unit 3: Elementary Data Structures:** Arrays- Ordered List, Sparse Metrics, Array Representations, **Stacks and Queues:** Organization, Operations, multiple stacks, types of queues, **Linked Lists:** Singly Linked List, Doubly Linked List, Doubly Linked List and Dynamic Storage management, Garbage collection and Compaction.

**Unit 4: Trees:** Terminology, Binary Trees, Tree representation, Tree traversal, Threaded Binary Trees, Binary Search trees, B-Tree, AVL- Tree, **Graph Algorithms:** Terminology and Representation, Traversal: BFS, DFS, Connected Components and Spanning trees, Dijkstra's algorithm.

**Unit 5: Searching and Sorting:** Linear Vs Binary search, **Sorting:** Insertion Sort, Merge Sort, Quick sort, Radix Sort.

### Reference Books:

1. Fundamentals of Data Structures by Ellis Horowitz and SartajSahani.
2. Introduction to Algorithms by Thomas H Core man et.al, PHI Publication.

**E-Book:**

1. [http://www.tutorialspoint.com/java/java\\_data\\_structures.htm](http://www.tutorialspoint.com/java/java_data_structures.htm)

**Lab Exercise: CSI457 Practical based on CSI410:**

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

**Course Outcomes:**

- After completing this course, students will be able to: Understand structure and behavior 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.

## 5. Computer Network

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<b>Course Code</b>	<b>CSI411</b>	<b>Course Title</b>	<b>Computer Network</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** Basic knowledge of Computer.

### Course Objectives:

1. To Study various structure and topologies of communication mediums.
2. Topics covered include: network protocols, Network architecture, network security, and some special topics like wireless and sensor networks.
3. 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 to Computer Networks:** Types of Network, Topologies, Client Server Model, Connection oriented, connection less services, Transmission Media- Guided, Unguided, Multiplexing, Bit rate, Baud Rate, Bandwidth etc. **Network Hardware Components:** Hub, Switch, Bridge, Router, Repeater, Gateway, peer to peer networks etc. **Network architecture layers:** Reference Models ISO- OSI Reference model, TCP/IP reference model. **Asynchronous Transfer Mode (ATM):** Cells, Header and Cell Formats, Layers in ATM.

**Unit 2: Data Link Layer:** Introduction, DLL Protocols, Frame Relay, X.25 protocol, MAC sub layer protocols, IEEE Standards for LAN, error detection and correction at DLL.

**Unit 3: Network layer:** Routing Algorithms, Congestion Control, **IP Addressing & DNS:** What are IP address?, class of IP address, Subnet Masks, MAC address, IPv4 and IPv6 IP address, **The Domain Name System:** concept, zones of DNS, **Switching:** Switching concept, Circuit Switching, Packet Switching. **Transport layer:** Introduction, TCP and UDP services, Multicasting, Spanning Tree.

**Unit 4: Network Security:** Cryptography Techniques, **Algorithms:** Secret key and Public key, DES, RSA. Digital Signature, Firewalls, Proxy server.

**Unit 5: Special Topics:** current and emerging trends: Next Generation Networks, Data Centers, Cloud Computing, GSM, GIS, Queuing models, ASN (abstract syntax Notation), Introduction to wireless and sensor networks, distributed Networks.

### Books:

1. Computer Networks – A. Tanenbaum, (PHI pub.)
2. Data and Computer Communication – Willam Stallings, PHI pub.

### Reference Books:

1. Data Communication & Network – Forouzan (TMH)
2. Internetworking with TCP/IP Vol-I – Comer (PHI pub.)
3. Data Communications and distributed Networks-V.B, Black, (Prentice Hall pub.)

**E-books:**

1. <http://newwayofengineering.blogspot.in/2014/12/computer-networks-tanenbaum-5th-edition.html>

**Lab Exercise: CSI458 Practical based on CSI411:**

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

**Course Outcomes:**

- 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.
- To Study various structure and topologies of communication mediums.
- The students will be able to understand network protocols, Network architecture, network security, and some special topics like wireless and sensor networks.
- Students will be able to acquire knowledge of the existing technologies as well as emerging research topics in computer networking.

## 6. Relational Database Management System using My SQL

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<b>Course Code</b>	<b>CSI412</b>	<b>Course Title</b>	<b>Relational Database Management System using MySQL</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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### Prerequisite

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

### Course Objective:

1. 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: Introduction:** An overview to DBMS, Data models, levels of abstraction, data independence, instances and schema, structure of DBMS, database users, functions of database administrators. **Entity relationship model:** Entities, Attributes and Entity sets, Relation and relationship sets, features of E-R model.

**Unit 2: Relational model:** Introduction, Integrity constraints over relations, Enforcing data integrity, relational data, logical database design, introduction to views,

**Unit 3: Relational algebra and relational calculus:** operations on relational algebra, operations on relational calculus, tuple relational calculus, domain relational calculus

**Unit 4: Relational Database Design:** Functional dependencies, schema refinement, Normal forms-first, second, third, BCNF, fourth and fifth normal forms, multivalued dependencies. **Structured Query language (SQL):** Basic SQL queries, nested queries, aggregate operators, null values, Embedded SQL. **Query Processing:** Concept, Need of query processing, procedure and its importance, query optimization, estimation of query processing cost, structure of query optimizer and Join strategies.

**Unit 5: Internals of RDBMS:** Transaction management, ACID property, Schedules and its various types, serializability, deadlock handling, high performance transaction systems. **Concurrency Control:** Lock based protocols, Timestamp based protocols, Validation techniques, Multiple Granularity. **Crash Recovery:** Failure classification, Log based recovery, Checkpoints, Shadow paging. **Distributed Databases:** Structure and design of distributed databases, Design of distributed databases, Transparency and autonomy, distributed query processing, recovery in distributed databases, Commit protocols. **Security and Integrity:** Authorization and views, security specification in SQL, Encryption.

**Book:**

1. Database System Concepts by Henry Korth and Abraham Silberschatz

**Reference Book:**

1. Relational database systems by Desai, Relational database concepts by Aho Ullman.

**Lab Exercise: CSI459 Practical based on CSI412:**

At least two practicals should be carried on each unit.

**Course Outcomes:**

- 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.
- To provide a sound introduction to the discipline of the basics of database management system.
- To give a good formal foundation on the relational model of data.
- To apply the various relational database concepts for solving real life problems.

## Semester – III

### 1. Advanced Programming using Python

<b>Course Code</b>	<b>CSI501</b>	<b>Course Title</b>	<b>Advance Programming using python</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. ( PR/Week) (Semester/Term Exam)</b>	<b>External</b>	<b>80 %</b>

**Prerequisite:** Student should possess basic programming skills using python.

#### Course Objectives:

1. This course will provide an opportunity for student to use python threading, GUI building, use of databases, Web Framework, Web Services etc.
2. FLASK framework, exposure to compatible framework will be provided to the student so that they may utilize python for their target web applications.

#### Course Outline:

**Unit 1: Threads:** Introduction to Threads, thread organization, thread architectures, starting new thread, thread modules, Creating thread using Threading module, Synchronizing threads. Controlling access to resources,

**Unit 2: GUI Design using TkInter or python:** Introduction, Layout Management, Widgets, Menus and Toolbars, Dialog boxes, Drawings, Nibbles. **Database Programming using python (MySQL):** Python Database Interfaces and APIs, Database Connections, Creating Table, Insert Operation, Read operation, Update and Delete Operation, Performing Transactions, Commit & Rollback Operations, Handling Errors.

**Unit 3: Web Framework using Web.py:** Introduction, URL Handling, GET and POST method, difference between GET and POST, Configuring server, starting server, Templating, Forms, Data bashing, development

**Unit 4: Web socket programming and Web services:** Introduction, About Sockets, socket module, types of sockets, Server Socket Methods, Client Socket Method, Design of simple server and client, python internet modules, **HTTP web services:** features of HTTP, using web services, debugging web services, setting user agents, handling redirects, handling compressed data.

**Unit 5: FLASK framework:** Introduction, Exploring FLASK, Coding Conventions, Environment, configuration, organizing project, handling templates, files, handling forms, deployments.

#### Reference Book:

1. Python 3 Web Development Guide, Michel Anders, Beginners guide, PACKT Publishing, open source.



**E-books: -**

1. Python Threading:
  - [http://www.tutorialspoint.com/python/python\\_multithreading.htm](http://www.tutorialspoint.com/python/python_multithreading.htm)
  - <http://pymotw.com/2/threading/>
  - <http://www.python-course.eu/threads.php>
2. GUI:
  - <https://wiki.python.org/moin/TkInter>
  - <https://wiki.python.org/jython/LearningJython>
  - [http://www.tutorialspoint.com/python/python\\_gui\\_programming.htm](http://www.tutorialspoint.com/python/python_gui_programming.htm)
3. Database:
  - Python MySQL API <https://wiki.python.org/moin/DatabaseInterfaces>
  - [http://www.tutorialspoint.com/python/python\\_database\\_access.htm](http://www.tutorialspoint.com/python/python_database_access.htm)
4. Web Framework: <http://webpy.org/docs/0.3/tutorial>
5. Python webSocket:
  - [http://www.tutorialspoint.com/python/python\\_networking.htm](http://www.tutorialspoint.com/python/python_networking.htm)
  - <https://docs.python.org/2/howto/sockets.html>
  - <https://docs.python.org/3.0/library/socket.html>
  - [http://www.diveintopython.net/http\\_web\\_services/index.html](http://www.diveintopython.net/http_web_services/index.html)
6. FLASK framework,
  - <http://www.fullstackpython.com/flask.html>
  - <https://exploreflask.com/>

**Lab Exercise: CSI552 Practical based on CSI501:**

Students have to complete minimum 10 practical assignments based on the course contents.

**Course Outcomes:**

- This course will provide an opportunity for student to use python threading, GUI building, use of databases, Web Framework, Web Services etc.
- FLASK framework, exposure to compatible framework will be provided to the student so that they may utilize python for their target web applications.
- Knowledge of different types of sockets, web services through python.
- Apply learning skills on socket programming in python.
- Environment, coding conventions, skills of handling & organizing multiple projects under python.
- Exposure of using platforms for python development.

## 2. Data Warehousing using MySQL

Course Code	CSI502	Course Title	Data Warehousing Using MySQL
No. of Credits	3 Credits (TH) 2 Credits (PR)	Internal	20%
Total Contact Hours	3 Hrs. (TH/Week) 4 Hrs. ( PR/Week) (Semester/Term Exam)	External	80%

**Prerequisite:** Student must aware of Relational Database management system, its organization and management using Queries

### Course Objectives:

A student completing this course unit should:

1. Have an understanding of the foundations, the design, the maintenance, the evolution and the use of data warehouses, by looking at these topics in a rigorous way.
2. Have mastered the basic range of techniques for creating, controlling and navigating dimensional business databases, by being able to use a powerful tool for dimensional modeling and analysis.

### Course Outline:

**Unit 1: Data Warehousing Concepts:** Data Warehouse Architectures, **Logical Design in Data Warehouses:** Logical Versus Physical Design in Data Warehouses, Data Warehousing Schemas, Data Warehousing Objects, **Physical Design in Data Warehouses:** Physical Design, Data Segment Compression, Integrity Constraints, Indexes and Partitioned Indexes, Materialized Views, Dimensions

**Unit 2: Hardware and I/O Considerations in Data Warehouses:** Overview of Hardware and I/O Considerations in Data Warehouses, Automatic Striping, Manual Striping, Local and Global Striping, Analyzing Striping, Striping Goals, RAID Configurations, Striping, Mirroring, and Media Recovery, RAID 5, The Importance of Specific Analysis, **Parallelism and Partitioning in Data Warehouses:** Granules of Parallelism, Block Range Granules, Partition Granules, Partitioning Design Considerations, Types of Partitioning, Partitioning Methods, Performance Issues for Range, List, Hash, and Composite Partitioning, Partitioning and Data Segment Compression, Data Segment Compression and Bitmap Indexes, Partition Pruning, Avoiding I/O Bottlenecks, Partition-Wise Joins, Full Partition-Wise Joins, Miscellaneous Partition Operations, **Indexes:** Bitmap Indexes, Benefits for Data Warehousing Applications, Cardinality, Bitmap Join Indexes, Bitmap Join Index Restrictions, B-tree Indexes, Local Indexes Versus Global Indexes

**Unit 3: Integrity Constraints:** Overview of Constraint States, Typical Data Warehouse Integrity Constraints, UNIQUE Constraints in a Data Warehouse, FOREIGN KEY Constraints in a Data Warehouse, RELY Constraints, Integrity Constraints and Parallelism, Integrity Constraints and Partitioning, **Materialized Views:** Creating, Registering Existing Materialized Views, Partitioning Materialized Views, Materialized Views in OLAP Environments, Choosing Indexes for Materialized Views, Invalidating Materialized Views Security Issues with Materialized Views, Altering Materialized Views, Dropping Materialized Views, Analyzing Materialized View Capabilities, **Dimensions:** Creating Dimensions, Viewing Dimensions, Using Dimensions with Constraints, Validating Dimensions, Altering Dimensions, Deleting Dimensions, Using the Dimension Wizard, **Overview of Extraction, Transformation, and Loading:** Overview of ETL, ETL Tools

**Unit 4: Managing the Warehouse Environment:** Overview of Extraction, Transformation and Loading, Extraction in Data Warehouses Transportation in Data Warehouses, Loading and Transformation, Maintaining the Data Warehouse, Change Data Capture, Summary Advisor, **Loading and Transformation:** Overview of Loading and Transformation in Data Warehouses, Loading Mechanisms, Transformation Mechanisms, Loading and Transformation Scenarios. **Maintaining the Data Warehouse:** Using Partitioning to Improve Data Warehouse Refresh, Optimizing DML Operations During Refresh, Refreshing Materialized Views, Using Materialized Views with Partitioned Tables, **Change Data Capture:** About Change Data Capture, Installation and Implementation, Security, Columns in a Change Table, Change Data Capture Views, Synchronous Mode of Data Capture, Publishing Change Data, Managing Change Tables and Subscriptions, Subscribing to Change Data, Export and Import Considerations

**Unit 5: Summary Advisor:** Overview of the Summary Advisor in the DBMS\_OLAP Package, Using the Summary Advisor, Estimating Materialized View Size, Is a Materialized View Being Used Summary Advisor Wizard, **Warehouse Performance:** Schema Modeling Techniques, SQL for Aggregation in Data Warehouses, SQL for Analysis in Data Warehouses, OLAP and Data Mining, Using Parallel Execution, Query Rewrite, **SQL for Aggregation in Data Warehouses:** Overview of SQL for Aggregation in Data Warehouses, ROLLUP Extension to GROUP BY, CUBE Extension to GROUP BY, GROUPING Functions, GROUPING SETS Expression, Composite Columns, Concatenated Groupings, Considerations when Using Aggregation, Computation Using the WITH Clause

**Reference Book:**

1. Kimball, Reeves Ross, Thornthwaite, The Data Warehouse Lifecycle Toolkit, John Wiley & Sons, 1998.
2. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Elsevier Second edition.
3. Arun K Pujari, Data Mining Techniques, University Press, Tenth edition 2006, ISBN 81 7371 380 4
4. Oracle9i Data Warehousing Guide Release 2 (9.2) Part Number A96520-01 by Oracle Press.

**Lab Exercise: CSC424 Practical based on CSC423:**

At least two experiments should carried out on each unit.

**Course Outcomes:**

On successful completion of this course, the learner will be able to

- Describe the fundamental concepts, benefits and problem areas associated with data warehousing
- Describe the various architectures and main components of a data warehouse.
- Will be able model data and design as per the application need

## Semester - IV

### 1. Data Mining

<b>Course Code</b>	<b>CSI503</b>	<b>Course Title</b>	<b>Data Mining</b>
<b>Number of Credits</b>	<b>3 Credits (TH)</b> <b>2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 HRS (TH/Week)</b>	<b>External</b>	<b>80 %</b>
<b>Hours</b>	<b>4 HRS (PR/Week)</b>	<b>(Semester/Term Exam)</b>	

**Prerequisite:** Student should have knowledge about the Relational Database Management System and Basic knowledge of probability and statistics.

#### Course Objectives:

1. To develop an understanding of the strengths and limitations of popular data mining techniques and to be able to identify promising business applications of data mining.
2. Students will be able to actively manage and participate in data mining projects executed by consultants or specialists in data mining.
3. A useful take away from the course will be the ability to perform powerful data analysis.

#### Course Outline:

**Unit 1: Introduction to Data Mining:** Why Mine Data? Commercial Viewpoint, Scientific Viewpoint Motivation, Definitions, Origins of Data Mining, Data Mining Tasks, Classification, Clustering, Association Rule Discovery, Sequential Pattern Discovery, Regression, Challenges of Data Mining. Data Mining: what is Data? Attribute Values, Measurement of Length, Types and Properties of Attributes, Discrete and Continuous Attributes, Types of data sets, Data Quality, Data Preprocessing, Aggregation, Sampling, Dimensionality Reduction, Feature subset selection, Feature creation, Discretization and Binarization, Attribute Transformation, Density. **Data Mining: Exploring Data:** Data Exploration Techniques, Summary Statistics, Frequency and Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Visualization, Representation, Arrangement, Selection, **Visualization Techniques:** Histograms, Box Plots, Scatter Plots, Contour Plots, Matrix Plots, Parallel Coordinates, Other Visualization Techniques, OLAP : OLAP Operations.

**Unit 2: Data Mining Classification:** Basic Concepts, Decision Trees, and Model Evaluation Classification: Definition, Classification Techniques, Tree Induction, Measures of Node Impurity, Practical Issues of Classification, ROC curve, Confidence Interval for Accuracy, Comparing Performance of Two Models, Comparing Performance of Two Algorithms. **Data Mining Classification:** Alternative Techniques Rule- Based Classifier, Rule Ordering Schemes, Building Classification Rules, Instance-Based Classifiers, Nearest Neighbor Classifiers, Bayes Classifier, Naive Bayes Classifier, Artificial Neural Networks (ANN), Support Vector Machines.

**Unit 3: Data Mining Association Analysis:** Basic Concepts and Algorithms Association Rule Mining, Frequent Itemset Generation, **Association Rule Discovery:** Hash tree, Factors Affecting Complexity, Maximal Frequent Horrible Closed Item set and Alternative Methods for Frequent Item set Generation, FP-growth Algorithm, Tree Projection, Rule Generation, Pattern Evaluation, Statistical Independence, Properties of a Good Measure, Support-based Pruning, Subjective Interestingness Measure.

**Unit 4: Data Mining Cluster Analysis:** Basic Concepts and Algorithms Applications of Cluster Analysis, Types of Clusters, **Clustering Algorithms:** K-means and its variants, Hierarchical clustering,

Density- based clustering. Graph-Based Clustering, Limitations of Current Merging Schemes, Characteristics of Spatial Data Sets, Shared Near Neighbor Approach, ROCK (Robust Clustering using links), Jarvis- Patrick Clustering, SNN Clustering Algorithm. Data Mining Anomaly Detection Anomaly/Outlier Detection, Importance, Anomaly Detection Schemes, Density-based: LOF approach.

**Unit 5: WEKA (Waikato Environment for Knowledge Analysis):** is a well-known suite of machine learning software that supports several typical data mining tasks, particularly data preprocessing, clustering, classification, regression, visualization, and feature selection. **Orange:** is a component-based data mining and machine learning software suite that features friendly yet powerful, fast and versatile visual programming front-end for explorative data analysis and visualization, and Python bindings and libraries for scripting. It contains complete set of components for data preprocessing, feature scoring and filtering, modeling, model evaluation, and exploration techniques. **Rapid Miner:** Formerly called YALE (Yet another Learning Environment), is an environment for machine learning and data mining experiments that is utilized for both research and real-world data mining tasks. **Hep Work:** Designed for scientists, engineers and students, intelligible and comprehensive open-source data integration, processing, analysis, and exploration platform. It gives users the ability to visually create data flows or pipelines, selectively execute some or all analysis steps, and later study the results, models, and interactive views.

#### **References:**

1. Introduction to Data Mining by Tan, Steinbach, Kumar.
2. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers.
3. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann, 2nd Edition (2005).
4. Principles of Data Mining: David Hand, Heikki Mannila & Padhraic Smyth, PHP Publication.

#### **Lab Exercise: CSI556, Practical based on CSI503:**

There should be minimum 10 lab assignment on the topics discussed in the course.

#### **Course Outcomes:**

- Understand the basic concepts and principles in data mining and visualization.
- Learn commonly used algorithms for mining both structured and unstructured (text) data.
- Understand how to handle a large amount of text data with search engines.
- Assess raw input data, and process it to provide suitable input for a range of data mining algorithms.
- Able to define the types of data and able to represent using relevant visualization method.
- Discover and measure interesting patterns from different kinds of databases. Able to classify the data, and associate it with classification or predication process.

## Elective-I

### 1. Remote Sensing

<b>Course Code</b>	<b>CSI521</b>	<b>Course Title</b>	<b>Remote Sensing</b>
<b>Number of Credits</b>	<b>3 Credits (TH), 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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

#### Course Objectives:

The course is designed to fulfill the following objectives:

- To acquire skills in storing, managing digital data for planning and development.
- To provide exposure to students in gaining knowledge on basic concepts and applications leading to modeling of natural resources management using Remote Sensing

#### Course Outline:

**Unit-1: Introduction:** Map as Model , Spatial Elements, Terminology, Classification of Maps, Map Scale, Spatial Referencing System, Map Projections, Grouping of Map Projections. What is Remote Sensing? Electromagnetic Radiation, Electromagnetic Spectrum, Interactions with the Atmosphere, Radiation – Target, Passive vs. Active Sensing, Characteristics of Images.

**Unit-2: Sensors:** On the Ground, In the Air, In Space, Satellite Characteristics, Pixel Size, and Scale, Spectral Resolution, Radiometric Resolution, Temporal Resolution, Cameras and Aerial Photography, Multispectral Scanning, Thermal Imaging, Geometric Distortion, Weather Satellites, Land Observation Satellites, Marine Observation Satellites, Other Sensors, Data Reception.

**Unit-3: Microwaves:** Introduction, Radar Basic, Viewing Geometry & Spatial Resolution, Image distortion, Target interaction, Image Properties, Advanced Applications, Polarimetry, Airborne vs. Spaceborne, Airborne & Spaceborne Systems.

**Unit-4: Image Analysis:** Introduction, Visual interpretation, Digital processing, Preprocessing, Enhancement, Transformations, Classification, Integration.

**Unit-5: Applications:** Introduction, **Agriculture:** Crop Type Mapping, Crop Monitoring, Forestry, Clear cut Mapping, Species identification, Burn Mapping, **Geology:** Structural Mapping, Geologic Units, **Hydrology:** Moisture, **Land Cover:** Rural/Urban change, Biomass Mapping.

**Reference Books:**

1. Fundamentals of Remote sensing Tutorial, natural resources Canada
2. M. Anji Reddy , “Remote Sensing and Geographical Information Systems” BSP BS Publication
3. Campbell, James B. 2011. Introduction to Remote Sensing, 5th edition. New York. The Guilford Press. ISBN 978-1609181765

**Course Outcomes:**

- At Course Completion Students can go for research in Remote Sensing or work in industry allied in this field.

## 2. Image Processing

Course Code	CSI522	Course Title	Image Processing
Number of Credits	3 Credits (TH) 2 Credits (PR)	Internal	20 %
Total Contact Hours Hours	3 HRS (TH/Week) 4 HRS (PR/Week)	External (Semester/Term Exam)	80 %

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

### Course Objective:

1. To introduce the student to various image processing techniques

### Course Outline:

**Unit-1: Digital Image Fundamentals:** Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, steps of digital image processing, brightness, contrast, hue, saturation, match band effect, Color image fundamentals-RGB, HIS models Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms-DFT, DCT, KLT,SVD.

**Unit-2: Image Enhancement:** Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image enhancement.

**Unit-3: Image Restoration:** Image Restoration- degradation model, Unconstrained restoration-Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

**Unit-4: Image Segmentation:** Edge detection, Edge linking via Hough transform–Thresholding-Region based segmentation–Region growing –Region splitting and Merging–Segmentation by morphological watershed– basic concepts – Dam construction – Watershed segmentation algorithm.

**Unit-5: Image Compression:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

### Textbooks:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Second Edition, 2004.
2. AnilK. Jain, Fundamentals of Digital Image Processing, Pearson 2002.

### Reference Books:

1. Kenneth R.Castleman,Digital Image Processing,Pearson,2006.
2. Rafael C.Gonzalez, Richard E. Woods, Steven Eddins, 'Digital Image Processing using MATLAB',Pearson Education,Inc., 2004.



**E-books:**

1. D. E. Dudgeon and R. M. Mersereau, 'Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
2. William K. Pratt, 'Digital Image Processing', John Wiley, New York, 2002
3. Milan Sonka et al., 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

**Lab Exercise: CSI558 Practical based on CSI522:**

1. Getting started with image processing software
2. Viewing digital images, bits and bytes, raster scan format, quantization
3. Scaling, translation and rotation, sums and differences
4. Histograms and stretches, convolutional filters
5. Fourier transforms and the frequency domain, filters
6. FFTs, Image filtering: smoothing and sharpening
7. 2D convolution and correlation
8. Implementation of Data Compression algorithms
9. Application of above algorithms for Brain Tumor detection, character detection, etc.

**Course Outcome:**

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

### 3. Cyber Law & Cyber Crime

Course Code	CSI523	Course Title	Cyber Law & Cyber Crime
Number of Credits	3 Credits (TH) 2 Credits (PR)	Internal	20 %
Total Contact Hours Hours	3 HRS (TH/Week) 4 HRS (PR/Week)	External (Semester/Term Exam)	80 %

**Prerequisite:** Student should have knowledge about the information technology, Ethics and Cyber law.

#### Course Objectives:

1. The course is designed to fulfill the following objectives:
2. To facilitate understanding about Cybercrimes, cyber security, forensics and cyber laws.
3. Exploration of the legal and policy developments in India for cyber space.

#### Course Outline:

**Unit-1:** Introduction, Evolution of the IT Act, Genesis and Necessity, Salient features of the IT Act, 2000; various authorities under IT Act and their powers; Penalties & Offences, amendments. E-commerce and Laws in India. Digital/ Electronic Signature in Indian Laws. E-Commerce; Issues and provisions in Indian Law. E-Governance; concept and practicality in India. E-Taxation issues in Cyberspace

**Unit-2:** Intellectual Property Rights, Domain Names and Trademark Disputes, Copyright in the Digital Medium, Copyright in Computer Programmes, Copyright and WIPO Treaties, Concept of Patent Right, Relevant Provisions of Patent Act 1970.

**Unit-3:** Cyber Forensic and Computer Crimes and types, Crimes targeting Computers: Definition of Cyber Crime & Computer related crimes, Classification & Differentiation between traditional crime and cybercrimes. Data Theft, Hacking, Spreading Virus & Worms, Phishing, Cyber Stalking/Bullying, Identity Theft & Impersonation, Credit card & Online Banking Frauds.

**Unit-4:** Cyber Forensics Investigation- Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking.

**Unit-5:** Cyber Security- Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Forming an Incident Response Team, Reporting Cybercrime, Operating System Attacks, Application Attacks.

**Books:**

1. Cyber Crimes & Laws by Sushma Arora & Raman Arora
2. Cyber Crimes & Legal Measures by Manish Kumar Chaubey
3. Textbook on Cyber Law by Duggal Pavan

**Course Outcome:**

- After the completion of course, the students will be able to:-Demonstrate a critical understanding of the Cyber law with respect to Indian IT/Act 2008.

## 4. Network Security

Course Code	CSI522	Course Title	Network Security
Number of Credits	3 Credits (TH) 2 Credits (PR)	Internal	20 %
Total Contact Hours	3 HRS (TH/Week)	External	80 %
Hours	4 HRS (PR/Week)	(Semester/Term Exam)	

**Prerequisite:** Before attending this course, students must have: Programming experiences in C/C++ or JAVA.

### Course Objectives:

1. To study the main security threats of communication networks.
2. To establish certain security mechanisms that avoids or considerably diminishes these threats.
3. To introduce modern cryptography techniques.
4. To study specific cryptography techniques that guarantee security in certain applications (email, e-commerce, web access, etc.).
5. To introduce the most widely known standards for each case

### Course Outline:

**Unit 1:** Introduction, Security Concepts, Threats and Risks, Attacks – Passive and Active, Security Services, Confidentiality, Authentication, Non-Repudiation, Integrity, Access Control, Availability. Security attacks, Unauthorized Access, Impersonation, Denial of Service Malicious Software, Viruses, Worms, Trojan, spyware

**Unit 2:** Access Control Models, Bell-LaPadula, Biba Integrity Model, Role Base Model. **Cryptography:** Secret Key and Public Key **Cryptosystems:** Cryptanalysis and attacks Symmetric Ciphers, **Block Ciphers and Stream Ciphers:** DES, Triple DES, RC4 and RC5, Cryptographic Modes, RSA., **Diffie Hellman key exchange Message Authentication:** MD5 and SHA 512 **Public Key Infrastructure (PKI):** Digital Certificates , Certificate Authorities

**Unit 3: Network Attacks:** Buffer Overflow, IP Spoofing, TCP Session Hijacking, Sequence Guessing, Network Scanning, ICMP, TCP sweeps, **Basic Port Scans Network Security:** Objectives and Architectures, Internet Security Protocols, IP encapsulating ,Security Protocol Virtual Private Network: concepts, PPTP, L2TP

**Unit 4:** Web security Consideration: Secured Socket Layer and Transport layer security, **Secured Electronic Transaction (SET) and Secured Mail:** Pretty Good Privacy (PGP), S/MIME Network Security Authentication Mechanisms: a) Passwords, b) Cryptographic authentication protocol, c) Smart Card, Biometrics) Digital Signatures and seals, f) Kerberos, g) X.509 LDAP Directory

**Unit 5:** Intruders, Intrusion Detection and Prevention, Firewall: Firewall Design Principles, Firewall Characteristics, **Types of Firewalls:** Packet Filtering Router, Stateful Inspection Firewall, Application Level Gateway or Proxy, Circuit level gateway, **Bastion Host Firewall Configuration:** Screened Host Firewall System, Screened Subnet Firewall System. **Cybercrimes:** Crimes against the computer, Crimes using a computer, **Indian IT Act 2000:** Objectives, Provisions, And Offenses.

**Reference Books:**

1. Network Security Essentials, William Stallings, Prentice-Hall.
2. Fundamentals of Computer Security Technology, Edward Amoroso, Prentice-Hall.
3. Cryptography and Data Security, Dorothy E. Denning, Addison-Wesley.
4. Computers under Attack, Peter J. Denning, Addison-Wesley.
5. Cryptography: Theory and Practice, Douglas R. Stinson, CRC Press.
6. Computer Crime and Computer Forensics, Dr. R. K. Tiwari, P. K. Sastri, K. V. Ravikumar, First Edition, 2002.
7. Computer Security Gollmann, Dieter, First Edition, 1999, John Wiley & Sons Ltd.

**Lab Exercise: CSI560 Practical based on CSI524:**

Lab exercise will cover the program related to each unit.

**Course Outcomes:**

- After completing this course, students will be able to:
- Explain concepts related to applied cryptography, including plaintext, cipher text, symmetric cryptography, asymmetric cryptography, and digital signatures.
- Explain the theory behind the security of different cryptographic algorithms.
- Explain common network vulnerabilities and attacks, defense mechanisms against network attacks, and cryptographic protection mechanisms.
- Outline the requirements and mechanisms for identification and authentication.
- Identify the possible threats to each mechanism and ways protect against these threats.
- Explain the requirements of real-time communication security and issues related to the security of web services.
- Explain the requirements of non-real-time security (email security) and ways to provide privacy, source authentication, message integrity, and non-repudiation.

## 5. Cloud Computing

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<b>Course Code</b>	<b>CSI525</b>	<b>Course Title</b>	<b>Cloud Computing</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** Programming languages like Java, Python etc. and Computer Network.

### Course Objective:

1. Cloud computing is recognized as one of the top five emerging technologies that will have a major impact on the quality of science and society over the next 20 years, its knowledge will help position our readers at the forefront of the field.

### Course Outline:

**Unit 1: Introduction:** Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Computing Platforms and Technologies. Principles of Parallel and Distributed Computing: Eras of Computing, Parallel vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing.

**Unit 2: Virtualization:** Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples (Xen, VMWare, Microsoft Hyper-V).

**Unit 3: Cloud Computing Architecture:** Cloud Reference Model, Cloud Reference Model (Public, Private, Hybrid, Community), Economics of the Cloud, Open Challenges. Aneka: Cloud Application Platform: Framework Overview of Aneka, Anatomy of the Aneka Container, Building Aneka Clouds, Cloud Programming and Management.

**Unit 4: Concurrent Computing:** Thread Programming: Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, Multithreading with Aneka, Programming Applications with Aneka Threads. High-Throughput Computing: Task Programming: Task Computing, Task-based Application Models, Aneka Task-Based Programming

**Unit 5: Data Intensive Computing:** Map-Reduce Programming: Data-Intensive Computing, Technologies for Data-Intensive Computing, Aneka Map Reduce Programming

### Text Book:

1. Buyya R., Vecchiola C., Selvi S. T., Mastering Cloud Computing, Mc-Graw Hill Education (India), 2013

**Reference Books:**

1. Rittinghouse J. W., Ransome J. F., Cloud Computing -Implementation, Management, and Security,CRC Press, 2010
2. Shroff G, Enterprise Cloud Computing-Technology, Architecture, Applications, Cambridge University Press, 2010.
3. Antonopoulos N, Gillam L, Cloud Computing -Principles, Systems and Applications, Springer, 2010

**Lab Exercise: CSI561 Practical based on CSI525:**

Lab exercise will cover the program related to each unit.

**Course Outcome:**

- They will be expert developers required to create Cloud applications and services.

## 6. Mobile Computing

<b>Course Code</b>	<b>CSI526</b>	<b>Course Title</b>	<b>Mobile Computing</b>
<b>Number of Credits</b>	<b>3 Credits (TH), 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. ( PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

**Prerequisite:** Student should possess concepts associated with wireless data communications and wireless networks.

### Course Objectives:

1. The course gives an introduction into principles, standards and solutions for mobile communication and its applications within the area of mobile computing will be provided to the students.
2. Based on the physical foundations of mobile communication channels, typical standards such as GSM were considered.
3. In the area of application support, typical software architectures and services for mobile computing are also being considered and discussed.
4. Examples of application areas covered are sales support and service engineering.

### Course Outline:

**Unit 1: Introduction to Mobile Communication:** Mobile Communication development, Communication Principal, Cellular networks, structure of cellular networks. **Frequency distribution and multiplexing:** methods, SDMA, FDMA, TDMA, CDMA, Spread Spectrum Techniques, **GSM:** Properties, Structures, Protocols, Channel Structure, Registers (HLR, VLR), Data Transmission, security aspects (SIM), **GSM Data switching:** HSCSD, GPRS, QOS.

**Unit 2: Universal Mobile Telecommunication system:** Characteristics, Performance, Architecture, frequency support, Hierarchical cell structure, UTMS Enhancement, Modulation basics, **Long Term Evaluation (LTE):** Characteristics, User equipment's, frequency bands, **WiMAX:** overview, frequency distribution worldwide, modulations under WiMAX, Network topologies, 4G Characteristics, data rate and mobility.

**Unit 3: Network types:** WAN, Applications of WAN, wireless standards, 802.11 frequency bands, 802.11 architecture, Medium access, Data Security in WLAN, Bluetooth and its applications. **Satellite and Broadcast Systems:** Basics, Geostationary satellite, LEO, MEO, GPS, Differential GPS, **Mobile Internet Protocols:** Mobile Internet, DHCP, Mobile IP, Principle, Agent Registration, Mobile IPv6, Cellular IP routing, TCP overview.

**Unit 4: Web Based Mobile Application:** Technologies for Web applications, challenges, mechanism, responsive web design, Fluid Grids, Design patterns, Semantics, Multimedia, Device access, connectivity, Performance and Integration, Server side adaptation. **Mobile platforms and Middleware:** Operating System for Mobile Devices, Case study of Android OS, Message Queuing, Mobile Databases, queries and transactions, synchronization.

**Unit 5: Context Aware Applications:** Types of context information, usage of context, context capturing, Context attributes, Activity Detection, context service, architecture, context models,



**Location based service:** location representation, location models, determining geometric positions, Positioning vs tracking, satellite system, application areas.

**Reference Book:**

1. J. Schiller, Mobile Communications, 2nd edition, Pearson Education, 2003

**E-book:**

1. Mobile Communication and Computing
2. [https://drive.google.com/file/d/0B3gHwwlwm\\_DWWERRUGlodHgxUUE/edit?pli=1](https://drive.google.com/file/d/0B3gHwwlwm_DWWERRUGlodHgxUUE/edit?pli=1)

**Lab Exercise: CSI562 Practical based on CSI526:**

There should be minimum 10 lab assignment on the topics discussed in the course.

**Course Outcome:**

- Student will be able understand the mobile communication and cutting edge technology for devising potential mobile computing applications to the society.

## 7. Enterprise Resource Planning (ERP)

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<b>Course Code</b>	<b>CSI527</b>	<b>Course Title</b>	<b>Enterprise Resource Planning (ERP)</b>
<b>Number of Credits</b>	<b>3 Credits (TH), 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. ( PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** Fundamentals of Business Process, Software Project Management

### Course Objectives:

1. To understand the role of Enterprise Resource Planning in business planning activities
2. Students will learn fundamentals of enterprise resource planning (ERP) systems concepts, and the importance of integrated information systems in an organization
3. This course will enable the student to learn the conceptual basis for enterprise-wide information system by illustrating procurement, production, and sales business processes using ERP software

### Course Outline:

**Unit 1: Fundamentals of ERP:** Needs and Evolution of ERP Systems, Benefits of ERP, Factors Affecting on ERP **ERP and Related Technologies:** Business Process Reengineering, Supply Chain Management, Online Analytical Processing (OLTP), Customer Relationship Management (CRM), Data Warehousing, Data Mining, Management Information System (MIS), Executive Support System (ESS), Decision Support System (DSS)

**Unit 2: Implementation of ERP:** Implementation Life Cycle: Implementation Methodologies and Approaches. ERP Life-Cycle and SDLC. ERP Implementation Cost and Time, ERP Project Management, Training. **Implementation Stakeholder's Roles and Responsibilities:** Vendors, Consultants, Top Management and End-Users.

**Unit 3: ERP Modules:** Finance, Production Planning, Material Management, Control & Maintenance, Human Resource Management (HRM), Inventory Control System, Quality Management, Marketing, Customization.

**Unit 4: ERP Auditing and Evaluation:** Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP) **ERP Auditing:** Process and Framework. **ERP Application:** ERP and E-Commerce – ERP and Internet, ERP and Cloud Computing.

**Unit 5: ERP Vendors:** BAAN, Oracle, PeopleSoft. **SAP:** Analytics, Procurement and Logistics Execution, Product Development and Manufacturing, Sales and Service, Corporate Service

**Text Books:**

1. ERP: A Managerial Perspective Book Description, Sadagopan S, Tata McGraw Hill.
2. ERP Ware: ERP Implementation Framework – Garg & Venkitakrishnan
3. ERP Concepts and Planning – Garg & Venkitakrishnan 2011
4. ERP Demystified, By Alexis Leon, Tata McGraw Hill.
5. Concepts in Enterprise Resource Planning, By Joseph A. Brady, Ellen F. Monk. Bret J. Wangner, Thomson Learning, 2001
6. Business Process Integration with SAP ERP, Simha Magal, Jeffrey Word

**Digital References:**

1. [en.wikipedia.org/wiki/Enterprise\\_resource\\_planning](http://en.wikipedia.org/wiki/Enterprise_resource_planning)
2. <http://www54.sap.com/solutions/bp/erp.html>
3. <http://www.saptechnical.com>
4. <http://www.infor.com/solutions/erp>

**Course Outcomes:**

- To comprehend the technical aspects of ERP systems;
- To understand concepts of reengineering and how they relate to ERP system implementations;
- To be able to map business processes using process mapping techniques;
- To understand the steps and activities in the ERP life cycle;
- To be able to identify and describe typical functionality in an ERP system;
- To obtain practical hands-on experience with one of the COTS ERP Software e.g. SAP, Oracle

## Elective-II

### 1. Programming J2ME

<b>Course Code</b>	<b>CSI528</b>	<b>Course Title</b>	<b>Programming J2ME</b>
<b>Number of Credits</b>	<b>3 Credits (TH), 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. ( PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

**Prerequisite:** Student should possess concepts of data communications and java.

#### Course Objectives:

1. The course gives an introduction to Java Micro edition which enables user to write applications for hand held devices.
2. Course offers comprehensive information about small computing technology, java architecture support for micro devices, record management using databases and generic framework.

#### Course Outline:

**Unit-1: J2ME overview** Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices, **Small Computing Technology:** Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants

**Unit-2: J2ME Architecture and Development Environment:** J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MIDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite, J2ME Wireless Toolkit J2ME Best Practices and Patterns: The Reality of Working in a J2ME World, Best Practices.

**Unit-3: Commands, Items, and Event Processing:** J2ME User Interfaces, Display Class, Palm OS Emulator, Command Class, Item Class, Exception Handling. High-Level Display: Screens: Screen Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class. Low-Level Display: Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

**Unit-4: Record Management System:** Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener  
JDBC Objects: The Concept of JDBC, JDBC Driver Types, JDBC Packages, Overview of the JDBC Process, Database Connection, statement Objects, Result set, Transaction Processing, Metadata, Data Types, Exceptions JDBC and Embedded SQL: Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Metadata, Updating Tables, Deleting Data form a Table, Joining Tables, Calculating Data, Grouping and Ordering Data, Subqueries, VIEWS.

**Unit-5: Generic Connection Framework:** The Connection, Hypertext Transfer Protocol, Communication Management Using HTTP Commands, Session Management, Transmit as a Background Process.

**Reference Book:**

1. J2ME: The Complete Reference, James Keogh, Tata McGraw Hill.

**E-book:**

1. J2ME Complete Reference  
[http://www.21gradi.it/Public/Java\\_J2ME\\_TheCompleteReference\\_McGrawHill\\_Osborne.pdf](http://www.21gradi.it/Public/Java_J2ME_TheCompleteReference_McGrawHill_Osborne.pdf)

**Additional References:**

1. Enterprise J2ME: Developing Mobile Java Applications – Michael Juntao Yuan, Pearson Education, 2004
2. Beginning Java ME Platform, Ray Rischpater, Apress, 2009
3. Beginning J2ME: From Novice to Professional, Third Edition, Sing Li, Jonathan B. Knudsen, A press, 2005
4. Kicking Butt with MIDP and MSA: Creating Great Mobile Applications, 1st edition, J. Knudsen, Pearson

**Lab Exercise: CSI564 Practical based on CSI528:**

There should be minimum 10 lab assignment on the topics discussed in the course.

**Course Outcome:**

- Student will be able to write applications to micro devices using java framework.

## 2. Open Source Web Programming using PHP

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<b>Course Code</b>	<b>CSI529</b>	<b>Course Title</b>	<b>Open Source Web Programming using PHP</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** The student must be aware of HTML, DHTML and client side scripting like JavaScript.

### Course Objectives:

1. PHP is a widely-used, free, and efficient server side scripting language, a powerful tool for making dynamic and interactive Web pages.
2. The objective of course is to provide domain knowledge to students who wish to learn web based, application development, and using object oriented PHP as the programming environment.
3. Web Servers installation like Apache, IIS Tomcat, XAMPP etc. and database connectivity using MySQL is also covered.

### Course Outline:

**Unit 1: Introduction:** Scripting language, Server –Client side scripting, What is PHP?, What is a PHP File?, What Can PHP Do?, Why PHP?, Install a web server, install PHP, install a database such as MySQL. A Walk through PHP Language Basics: Lexical Structure, Data Types, Variables, Constants, Expressions and Operators, Flow-Control Statements, Switch loop, for and for each loop, Including Code, Embedding PHP in Web Pages.

**Unit 2: PHP Functions:** User Defined Functions, Function Arguments, Default Argument Value Functions - Returning values, **Strings:** Quoting String Constants, Printing Strings, Accessing Individual Characters, Cleaning Strings, Encoding and Escaping, Comparing Strings, Manipulating and Searching Strings, **Arrays:** Indexed Versus Associative Arrays, Identifying Elements of an Array, Storing Data in Arrays, Multidimensional Arrays, Extracting Multiple Values, Converting Between Arrays and Variables, Traversing Arrays, Sorting; **PHP Super globals, Regular Expressions:** POSIX-Style Regular Expressions, Perl-Compatible Regular Expressions.

**Unit 3: Classes and Objects:** Terminology, Creating an Object, Accessing Properties and Methods, Declaring a Class, Introspection, Serialization, **PHP Form Handling :** GET and POST methods, PHP Form Validation, Forms - Required Fields, **Web Techniques:** HTTP Basics, Variables, Server Variables, Server Information, Processing Forms, Setting Response Headers, Session, cookies, files, Maintaining State, SSL.

**Unit 4: PHP 5 File Handling:** File Upload, PHP include and require Statements. **Graphics:** Embedding an Image in a Page, GD Extension, Basic Graphics Concepts, **PDF:** PDF Extensions, Documents and Pages, Text, Images and Graphics, Navigation, Other PDF Features.

**Unit - 5: Using PHP to Access a Database:** MySQL database Basics, MySQL Database, Connect, Create DB, Create Table, Insert Multiple, Select Data, Delete Data, Update Data, Limit Data.

**Reference Books:**

- Advanced PHP for Web Development, by Christopher Cosentino, Prentice Hall PTR.
- PHP Black Book Paperback by Peter Moulding.
- PHP 5.1 for beginners by Evan Bayross and Sharman Shah, SPD Publications.
- Programming PHP by Rasmus Lerdorf and Kevin Tatroe, Orilly Publications.

**E-books (Web Tutorials):**

- <http://php.net/manual/en/tutorial.php>
- <http://docstore.mik.ua/orelly/webprog/pcook/index.htm>

**Lab Exercise: CSI565 Practical based on CSI529:**

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

**Course Outcomes:**

- After completion of course the student should be able to develop web applications of open source platform and aware of configuration of tools required to develop web applications.

### 3. VB.NET using MySQL

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<b>Course Code</b>	<b>CSI529</b>	<b>Course Title</b>	<b>VB.NET using MySQL</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20 %</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80 %</b>

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**Prerequisite:** This course is intended for both novice and experienced programmers who have a minimum of three months programming experience and have basic Microsoft Windows navigation skills.

#### Course Objectives:

1. The course provides students with the knowledge and skills needed to develop applications in Microsoft Visual Basic .NET for the Microsoft .NET platform.
2. The course focuses on user interfaces, program structure, language syntax, and implementation details.
3. This is the first course in the Visual Basic .NET curriculum and will serve as the entry point for other .NET courses.

#### Course Outline:

**Unit 1: Getting Started:** Microsoft Visual Studio .NET Architecture, Application in Visual Basic .NET, Basic, .NET Concepts, Exploring the Development Environment, Creating a Visual Basic .NET Projects. Using Variables and Arrays: Introduction to Data Types, Using Variables, Variable Scope, Converting Data Types, Creating and Using Structures, Storing Data in Arrays.

**Unit 2: Working with Procedures:** Creating Procedures, Using Procedures, Using Predefined Functions Decision Structures and Loops: Using Conditional Expressions, Using Decision Structures, Using Conditional Loop Structures. Validating User Input: Restricting User Input, Validating Field Data, Validating Form Data

**Unit 3: Object-oriented Programming in Visual Basic .NET:** Understanding Classes, Working with Classes, Using Shared Members, Inheritance, Polymorphism, and Namespaces Handling Errors and Exceptions: Types of Errors, Using the Debugger and Handling Exceptions.

**Unit 4: Working with Forms and Controls:** Understanding Programming Concepts, Working with Windows Forms Working with Controls, Styling Your Code. Enhancing the User Interface: Creating Menus, Creating Status Bars, Creating Toolbars.

**Unit 5: Using ADO.NET:** Database Concepts, Overview of ADO.NET, Overview of MySQL, Working with Database using MySQL, Create Insert, delete Table commit etc. Deploying Applications: Introduction to Deployment, Deploying a Windows- based Application



**Reference Books:**

1. Steven Holzner, Visual Basic .NET Programming Black Book, Wiley Publishing.
2. Heinrich Gantenbein, Microsoft Visual Basic .NET 2003 Unleashed

**E-book:**

1. [http://www.tutorialspoint.com/mysql/mysql\\_tutorial.pdf](http://www.tutorialspoint.com/mysql/mysql_tutorial.pdf)

**Lab Exercise: CSI566 Practical based on CSI530:**

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

**Course Outcomes:**

- After completing this course, students will be able to; Create a simple Visual Basic.NET– based application based on the Windows Application template.
- Create a simple Visual Basic.NET–based Web Forms application that uses an XML Web Service.
- Access and manipulate data in a MySQL database by using ADO.NET, and Build, package, and deploy an application.
- Understanding the architecture of VB.NET and Its Tools.
- Understanding the concepts of Visual Basic .NET–based application on the Windows Application template.

## 4. GIS

<b>Course Code</b>	<b>CSI531</b>	<b>Course Title</b>	<b>GIS</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20%</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80%</b>

**Prerequisite:** To aware about remote sensing basics

### Course Objectives:

1. Introduction to Geographic Information Systems is a course designed to provide students in a solid foundation in both GIS concepts and the use of GIS.
2. Introduction to GIS strikes careful balance between GIS concepts and hands-on applications.
3. The main portion of the course presents GIS terms and concepts and helps students learn how each one fits into a complete GIS system.
4. At the end of the course students can work with actual GIS exercises and the necessary data to solve the problem.

### Course Outline:

**Unit 1: Fundamentals of GIS:** Introduction, Roots of GIS, Overview of Information System, Contribution Disciplines, GIS Definitions and Terminology, GIS Queries, GIS Architecture, Theoretical Models of GIS, Theoretical Framework for GIS, GIS Categories, Levels/Scales of Measurement

**Unit 2: Spatial Data Modelling:** Introduction, Stages of GIS Data Modelling, Graphic Representation of Spatial Data, Raster GIS Models, Vector GIS Models, Comparison of Raster and Vector Models

**Unit 3: GIS Data Management:** Introduction, Data Base Management Systems, GIS Data File Management, Database Models, Storage of GIS Data, Object Based Data Models, Organizational Strategy of DBMS in GIS

**Unit 4: Data Quality Issues:** Introduction, Components of Data Quality, Accuracy, Precision and Resolution, Completeness, Sources of Error in GIS, Modelling Errors, Error Evaluation by Graphical Methods, User Satisfaction Issues

**Unit 5: Data Analysis and Modelling:** Introduction, Format Conversion, Data Medium Conversion, Spatial Measurement Methods, Reclassification, Buffering Techniques, Overlay Analysis, DTM Generation, Modelling Networks, GIS Output, Integration of Remote Sensing and GIS

### Reference Books:

1. M. Anji Reddy , “Remote Sensing and Geographical Information Systems” BSP BS Publication
2. Paul Bolstad, “GIS Fundamentals: A First Text on Geographic Information Systems” (2nd edition), by published by Eider Press
3. Chang, K.T., “Introduction to Geographic Information Systems (Sixth Edition)”. McGraw Hill, New York, 418 p

**Lab Exercise: CSI567 Practical based on CSI531:**

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

**Course Outcomes:**

After successfully completion of the course students are able to;

- describe the functional basis of a GIS
- appreciate the potential uses of GIS
- consider the benefits and shortcomings of using GIS
- outline the key data quality issues involved in using GIS
- develop a strategy to implement an effective GIS

## 5. Biometrics

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<b>Course Code</b>	<b>CSI532</b>	<b>Course Title</b>	<b>Biometrics</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20%</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80%</b>

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**Prerequisite:** Student must have knowledge of image processing, pattern recognition and neural networks.

### Course Objectives:

1. Biometric recognition, or simply biometrics, is a rapidly evolving field with applications ranging from accessing one's computer, to gaining entry into a country. Biometric systems rely on the use of physical or behavioral traits, such as fingerprints, face, voice and hand geometry, to establish the identity of an individual.
2. The deployment of large-scale biometric systems in both commercial (e.g., grocery stores, amusement parks, airports) and government (e.g., US-VISIT) applications, increases the public's awareness of this technology.
3. This rapid growth also highlights the challenges associated with designing and deploying biometric systems.
4. Indeed, the problem of biometric recognition is a grand challenge in its own right.
5. The past five years have seen a significant growth in biometric research resulting in the development of innovative sensors, robust and efficient algorithms for feature extraction and matching, enhanced test methodologies and novel applications.
6. These advances have resulted in robust, accurate, secure and cost effective biometric systems.
7. The main objective of this course is study the basics and advanced development of biometrics.

### Course Outline:

**Unit 1:** Foreword by James L. Wayman, San Jose State Fingerprint Recognition.- Face Recognition, Iris Recognition, University, Preface, Introduction to Biometrics, Recognition, Hand Geometry Recognition, Gait

**Unit 2:** The Ear as a Biometric, Voice Biometrics, A Palm print Authentication System.- On-Line Signature Verification, 3D Face Recognition.

**Unit 3:** Automatic Forensic Dental Identification, Hand Vascular Pattern Technology.

**Unit 4: Introduction to Multibiometrics:** Multispectral Face Recognition, Multibiometrics Using Face and Ear, Incorporating Ancillary Information in Multibiometric Systems.

**Unit 5:** The Law and the Use of Biometrics, Biometric System Security, Spoof Detection Schemes, Linkages between Biometrics and Forensic Science, Biometrics in Government Sector, Biometrics in the Commercial Sector, Biometric Standards, Biometrics Databases, Index.

**Text Book**

1. Handbook of Biometrics, Jain, Anil K.; Flynn, Patrick; Ross, Arun A. (Eds.), 2008, Springer, ISBN 978-0-387-71040-2

**Lab Exercise: CSI568 Practical based on CSI532:**

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

**Course Outcomes:**

- The aim of this course is to introduce the principles of biometric authentication.
- The course will study those biometric characteristics which have commercial implementations, as well as emerging techniques, discussing hopes and fears related to the presented modalities.

## 6. Android Programming

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<b>Course Code</b>	<b>CSI533</b>	<b>Course Title</b>	<b>Android Programming</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20%</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External (Semester/Term Exam)</b>	<b>80%</b>

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**Prerequisite:** Basic knowledge of any programming environment.

### Course Objective:

- To provide the emulator based environment training to develop the mobile apps.

### Course Outline:

**Unit 1: Environment Setup:** Setup Java Development Kit (JDK), Android SDK, Eclipse IDE, Android Development Tools (ADT) Plugin, Create Android Virtual Device. **Architecture:** Linux kernel, Libraries, Android Runtime, Application Framework.

**Unit 2: Application Components:** Application Components Activities, Services, Broadcast Receivers, Content Providers, Additional Components, Create Android Application, Anatomy of Android Application, The Main Activity File, The Manifest File, The Strings File, The R File, The Layout File, Running the Application.

**Unit 3: Resources Organizing & Accessing:** Alternative Resources, Accessing Resources. **Intents and Filters:** Intent Objects, Action, Android Intent Standard Actions, Data, Category, Extras, Flags, Component Name, **Types of Intents:** Explicit Intents, Implicit Intents.

**Unit 4: UI Layouts:** Android Layout Types, Relative Layout Attributes, Grid View Attributes, Sub-Activity, Layout Attributes, View Identification, UI Controls, Android UI Controls, Text View Attributes, Auto Complete Text View Attributes, Button Attributes, Image Button Attributes, Check Box Attributes, Toggle Button Attributes, Radio Button Attributes, Radio Group Attributes.

**Unit 5: Event Handling:** Event Listeners & Event Handlers, Event Listeners Registration, Styles and Themes, Defining Styles, Using Styles, Style Inheritance, Android Themes, Default Styles & Themes, Custom Components, Creating a Simple Custom Component.

### References:

- Android Tutorial, Simply Easy Learning by tutorialspoint.com.
- Link: [http://www.tutorialspoint.com/android/android\\_tutorial.pdf](http://www.tutorialspoint.com/android/android_tutorial.pdf)

### Lab Exercise: CSI569 Practical based on CSI533:

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

### Course Outcome:

- Students can absorb in Android Mobile Apps development industries or they can start their own apps development business.

## 7. Human Computer Interaction

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<b>Course Code</b>	<b>CSI534</b>	<b>Course Title</b>	<b>Human Computer Interaction</b>
<b>Number of Credits</b>	<b>3 Credits (TH) 2 Credits (PR)</b>	<b>Internal</b>	<b>20%</b>
<b>Total Contact Hours</b>	<b>3 Hrs. (TH/Week) 4 Hrs. (PR/Week)</b>	<b>External</b>	<b>80%</b>

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### Prerequisites:

Before attending this course, students must have:

- Basic knowledge in informatics and use of IT-systems in different ways in the society
- Student should know the Object oriented programming Concepts.
- Knowledge on software engineering.

### Course Objectives:

By taking courses in HCI, we expect students to have gained an understanding of the following:

1. The scope of issues affecting human-computer interaction.
2. The importance of the user interface to motivate the study of topics like HCI and user interfaces.
3. The impact of good and bad user interfaces.
4. The diversity of users and tasks (applications) and their impact on the design of user interfaces.
5. The limits of knowledge of individuals developing HCI systems.
6. The need to work with others, skilled in diverse areas such as software engineering, human factors, technical communication, statistics, graphic design, etc.
7. Cost/benefit trade-offs in HCI design.
8. Different system development lifecycles including those particularly applicable to HCI systems (e.g., iterative design, implementation, evaluation, and prototyping).
9. How HCI concerns can be incorporated into systems development lifecycles.
10. The need to evaluate system usability (e.g., someone will evaluate usability even if not the developer, and, in some cases, not evaluating constitutes professional misconduct).
11. The existence of design, implementation, and evaluation tools for developers with diverse needs and technical expertise.

### Course Outline:

**Unit-1:** The human, the computer, the interaction, Paradigms.

**Unit-2:** Interaction design basics, HCI in the software process, Design rules, Implementation support.

**Unit-3:** Evaluation techniques, Universal design, User support, Cognitive models.

**Unit-4:** Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialogue notations and design

**Unit-5:** Models of the system, Modeling rich interaction, Groupware, Ubiquitous computing and augmented realities, Hypertext, multimedia, and the World Wide Web.

**Reference Books:**

1. Human Computer Interaction 3e - Dix, Finlay, Abowd, Beale
2. Readings in Human Computer Interaction: Towards the Year 2000: 2nd Edition; Ronald Baecker, Jonathan Grudin, William Buxton, Saul Greenberg
3. William M. Newman and Michael G. Lamming, Interactive System Design, Addison- Wesley (1995) (0-201-63162-8)
4. Jakob Nielsen, Designing Web Usability: The Practice of Simplicity, New Riders, 1st Ed(Dec 1999) (1-562-05810-X)
5. Jenny Preece - Yvoone Rogers, Helen Sharp, David Benyon, Simon Holland and Tom Carey, Human-Computer Interaction, Addison-Wesley (1994) (0-201-62769-8)

**Lab Exercise: CSI570 Practical based on CSI534:**

There should be minimum 10 lab assignment on the topics discussed in the course.

**Course Outcomes:**

On completion of this course according to course goals, the student should be able to:

- Understand the basics of human and computational abilities and limitations.
- Understand basic theories, tools and techniques in HCI.
- Understand the fundamental aspects of designing and evaluating interfaces.
- Practice a variety of simple methods for evaluating the quality of a user interface.
- Apply appropriate HCI techniques to design systems that are usable by people.



## Service Course

The Department of Computer Science and Information Technology provides the following service course for the students of the parent department and other departments of the university.

### **Communication Skill**

Course Code	CSC541	Course Title	Communication Skill
Number of Credits	4 Credits (TH)	Oral	50%
Total Contact Hours	4 Hrs. (TH/Week)	Written (Semester/Term Exam)	50%

**Prerequisite:**

- No specific prerequisite is needed for this course.

**Course Objectives:**

- To make student well versatile in profession and technical communication skills

**Course Outline:**

Sr. No.	Practical	Theory	Duration In Hours
1	<b>Development of Proficiency in English</b> : <ul style="list-style-type: none"> <li>• Practice on oral and spoken, accent, pitch, amplitude, intonation, and pause.</li> <li>• Etiquettes while speaking</li> <li>• Analysis of pictorial expression</li> </ul>	<ul style="list-style-type: none"> <li>• Components of effective communication</li> <li>• Objectives of communication skills and its types</li> <li>• Nonverbal communication and its importance               <ul style="list-style-type: none"> <li>✓ Facial expression</li> <li>✓ Posture</li> <li>✓ Gestures</li> <li>✓ Eye contact</li> <li>✓ Dress code</li> </ul> </li> </ul>	Theory : 3 Pract : 3 Total : 6
2	<b>Development of skills for</b> <ul style="list-style-type: none"> <li>• Making of sentences</li> <li>• Correction of errors in sentence</li> <li>• Leave application</li> </ul>	<b>Basic Grammar</b> <ul style="list-style-type: none"> <li>• Parts of speech</li> <li>• Synonyms and Antonyms</li> <li>• Vocabulary enhancement</li> </ul>	Theory : 3 Pract : 3 Total : 6
3	<b>Presentation Skills</b> <ul style="list-style-type: none"> <li>• Slide preparation</li> <li>• Emphasis on how to read them</li> <li>• Time management</li> </ul>	<b>Four Methods</b> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Presentation</li> <li>• Evaluation</li> <li>• Conclusion / Summarization</li> </ul>	Theory : 2 Pract : 3 Total : 5
4	<b>Speech strategies</b> <ul style="list-style-type: none"> <li>• Planning</li> <li>• Practice</li> </ul>	<b>Methods</b> <ul style="list-style-type: none"> <li>• How to read audience</li> </ul>	Theory : 2 Pract : 2 Total : 4

	<ul style="list-style-type: none"> <li>• Stage daring</li> <li>• Building self confidence</li> </ul>	<ul style="list-style-type: none"> <li>• How to pay attention to body language</li> <li>• How to catch audience</li> </ul>	
5	<b>Co-ordination Skills</b> <ul style="list-style-type: none"> <li>• How to participate in: <ul style="list-style-type: none"> <li>✓ Group discussion</li> <li>✓ Debate</li> <li>✓ Negotiation</li> <li>✓ Argument</li> </ul> </li> </ul>	<b>Concept and difference between :</b> <ul style="list-style-type: none"> <li>• Group discussion</li> <li>• Debate</li> <li>• Negotiation</li> <li>• Argument</li> </ul>	Theory : 3 Pract : 7 Total : 10
6	<b>Bench to benchmark</b> <ul style="list-style-type: none"> <li>• E mail writing</li> <li>• Resume / CV writing</li> <li>• Mock interviews</li> </ul>	<b>Bench to benchmark</b> <ul style="list-style-type: none"> <li>• Protocols for : <ul style="list-style-type: none"> <li>✓ Writing E mail</li> <li>✓ Resume</li> <li>✓ Memo</li> <li>✓ Interview Skills</li> </ul> </li> </ul>	Theory : 2 Pract : 2 Total : 4
7	<b>Soft Skills</b> <ul style="list-style-type: none"> <li>• Problem solving</li> <li>• Decision making</li> <li>• Dealing with Society effectively</li> <li>• Conflict resolution</li> </ul>	<b>Soft Skills</b> <ul style="list-style-type: none"> <li>• Introduction to soft skills</li> <li>• Empathy</li> <li>• Ideas for leadership</li> </ul>	Theory : 2 Pract : 2 Total : 4

**Course Outcomes:**

- Express themselves well verbally and improve academic and technical level of writing.
- Present ideas in a clear and effective manner
- Make the student ready for facing interviews and improve their professional personality.

## **Program Outcomes(POs)**

**And**

### **Program Specific Outcomes (PSOs)**

#### **1. M. Sc. Information Technology**

- i. An ability to apply knowledge of Computer science for developing solutions to complex scientific problem of societal and industrial needs.
- ii. Ability to design and conduct experiments, as well as to analyze and interpret data.
- iii. To expose students to tools and techniques of Computer Science and Engineering so that they can comprehend, analyze, design and create innovative computing products and solutions for real life problems.
- iv. To prepare students to excel in Computer Science and Engineering program through quality education enabling them to succeed in computing industry profession.
- v. To provide students with a solid foundation in mathematics, engineering, basic science fundamentals required to solve computing problems
- vi. Have an enhanced ability to prepare technical point papers, brief their seniors, and defend their conclusions.
- vii. An ability to identify opportunities for establishing an enterprise.
- viii. Demonstrate an in depth and comprehensive understanding of Computer Science.
- ix. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- x. Have an enhanced ability to apply the knowledge learned to solve technical problems that arise in research they conduct or supervise.
- xi. To develop professional skills in students that prepares them for immediate employment and for lifelong learning in advanced areas of computer science and related fields and to prepare students which are an asset to the country, who can contribute towards nation building.

### Program Articulation Matrix

Sr.No	Course Outcomes ( CO)			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	Sem	Code	Course Title											
1	I	CSI402	Research Methodology	Y										
2	I	CSI403	Programming in Core Java		Y									
3	I	CSI404	Computer System Architecture			Y								
4	I	CSI405	Operating System				Y							
5	I	CSI406	Information Theory					Y						
6	II	CSI407	Research Project Review Writing						Y					
7	II	CSI408	Interactive Programming using Python							Y				
8	II	CSI409	Software Engineering and CASE Tools								Y	Y		
9	II	CSI410	Data Structure										Y	
10	II	CSI411	Computer Network								Y			
11	II	CSI412	Relational Database Management System using MySQL											Y
12	III	CSI501	Advance Programming using python							Y				
13	III	CSI502	Data Warehousing Using MySQL										Y	
14	III	CSI524	Network Security									Y		
15	IV	CIS503	Data Mining										Y	
16	IV	CSI530	VB.NET using My SQL							Y				

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IQAC Cell  
DEPARTMENT OF  
COMPUTER SCIENCE AND  
INFORMATION TECHNOLOGY  
Dr. Babasaheb Ambedkar Marathwada University,  
Aurangabad, (MS) India.  
Department Web: <http://bamu.ac.in/dept/csit/index.htm>