# M.Sc. COMPUTER SCIENCE

## CHOICE BASED CREDIT SYSTEM (CBCS)

**Curriculum and Syllabus**

**Regular (2022 – 2023)**



**DEPARTMENT OF COMPUTER SCIENCE**

**FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT**

# KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section3 of UGC Act,1956)

## FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)

## POST– GRADUATE PROGRAMMES
## (REGULAR PROGRAMME)

## REGULATIONS
### (2022)

## CHOICE BASED CREDIT SYSTEM(CBCS)

## KARPAGAM ACADEMY OF HIGHER EDUCATION
**(Deemed to be University)**
**(Established Under Section 3 of UGC Act, 1956)**
**(Accredited with A+ Grade by NAAC in the Second Cycle)**
**Eachanari (Post), Coimbatore – 641 021.**
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**FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT**
**POST-GRADUATE PROGRAMMES**
**(M.Sc., M.Com.)**

**REGULAR MODE**
**CHOICE BASED CREDIT SYSTEM (CBCS)**

**REGULATIONS - 2022**

**The following Regulations are effective from the academic year 2022-2023 and are applicable to the candidates admitted in Post Graduate (PG) Degree programmes in the Faculty of Arts, Science, Commerce and Management, Karpagam Academy of Higher Education (KAHE).**

## 1 PROGRAMMES OFFERED,

## MODE OF STUDY AND   ADMISSION REQUIREMENTS

### 1.1 P.G. PROGRAMMES OFFERED

The various P.G. Programmes offered by the KAHE are listed in the table below.

| S. No. | Programme Offered |
|--------|-------------------|
| 1 | M.Sc. Biochemistry |
| 2 | M.Sc. Microbiology |
| 3 | M.Sc. Biotechnology |
| 4 | M.Sc. Physics |
| 5 | M.Sc. Chemistry |
| 6 | M.Sc. Mathematics |
| 7 | M.Sc. Computer Science |
| 8 | M.Sc. Applied Astrology |
| 9 | M.Com. |
| 10 | MA English |

## 1.2 MODE OF STUDY

**Full-Time**
All programmes are offered under Full-Time Regular mode. Candidates admitted under 'Full-Time' should be present in the KAHE during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

## 1.3 ADMSSION REQUIREMENTS (ELIGIBILITY)

Candidates for admission to the first semester Master's Degree Programme shall be required to have passed an appropriate Degree Examination of this Karpagam Academy of Higher Education or any other University accepted by the KAHE as equivalent thereto. Admission shall be offered only to the candidates who possess the qualification prescribed against each course as given in the table below.

### QUALIFICATIONS FOR ADMISSION

| S. No. | Name of the Programme Offered | Eligibility |
|---|---|---|
| 1 | M.Sc. Biochemistry | B.Sc. Degree with Biology / Biochemistry / Chemistry / Biotechnology / B.F.Sc. / Polymer Chemistry / Microbiology/ Zoology / Botany / Plant Science / Plant Biotechnology / Animal Science / Animal Biotechnology / B.Pharm / Industrial Chemistry / Applied Microbiology / Medical Microbiology / Human Genetics / Medical Genetics / Molecular Biology / Genetics Technology / Environmental Science / Environment Biotechnology / Genetics Engineering / Bioinformatics / Plant Biology & Biotechnology / Animal Cell & Biotechnology / Agriculture / Medical Lab Technology / Nutrition & Dietetics |
| 2 | M.Sc. Microbiology | B.Sc. Microbiology / Applied Microbiology / Industrial Microbiology / Medical Microbiology / Botany / Zoology / Biology / Biotechnology / Molecular Biology / Genetic Engineering / Biochemistry / Agriculture / Forestry / Medical Lab Technology / Life Sciences |

| 3 | M.Sc. Biotechnology | B.Sc. Degree with Biology / Biochemistry / B.Sc Biology with Chemistry Ancillary / B.F.Sc. / Microbiology / Zoology / Botany / Plant Science /Plant Biotechnology / Animal Science /Animal Biotechnology / B.Pharm / Applied Microbiology / Medical Microbiology / Human Genetics / Medical Genetics / Molecular Biology / Genetics / Environmental Science / Environment Biotechnology / Genetics Engineering / Bioinformatics / Plant Biology & Biotechnology / Animal Cell & Biotechnology / Agriculture / B.Tech ( Biotech) |
|---|---|---|
| 4 | M.Sc. Physics | B.Sc. Physics, B.Sc. Physics (CA) / B.Sc. Applied science |
| 5 | M.Sc. Chemistry | B. Sc. Chemistry, Industrial Chemistry, Polymer Chemistry |
| 6 | M.Sc. Mathematics | B.Sc. Mathematics / B.Sc. Mathematics with Computer Applications |
| 7 | M.Sc. Computer Science | B.Sc. Computer Science / Computer Technology / Information Technology / Electronics / Software Systems / BCA/ B.Sc. Applied Sciences |
| 8 | M.Com | B.Com./BCom.(CA)/B.Com(PA)/B.Com(Finance&Insurance)/ B.Com.(e-Commerce)/ B.Com.(IT) /B.B.M. /B.B.M.(CA) /B.B.A./B.B.A (CA) / B.Com (CS), B.A. Co-Operation / Bachelor's Degree in Bank Management/ B.A. Economics / B. Com Financial Analytics/ B. Com International Accounting and Finance |
| 9 | MA English | BA (English)/Any UG degree with first class in Part II - English |

## 2    DURATION OF THE PROGRAMMES

2.1    The minimum and maximum period for completion of the P.G. Programmes are given below:

| Programme | Min. No. of Semesters | Max. No. of Semesters |
|---|---|---|
| M.Sc., M.Com., MA | 4 | 8 |

2.2    Each semester normally consists of 90 working days or 450 Instructional hours for full-time mode of study. Examination shall be conducted at the end of every semester for the respective courses.

## 3. CHOICE BASED CREDIT SYSTEM

**3.1** All programmes are offered under Choice Based Credit System with a total credit range from 87 to 93 for the PG programmes.

### 3.2 Credits
Credits means the weightage given to each course of study by the experts of the Board of Studies concerned.

## 4. STRUCTURE OF THE PROGRAMME
Every Programme will have a curriculum and syllabus consisting of core courses, elective courses, open elective and project work.

### a. Core course
Core course consists of theory and practical and the examinations shall be conducted at the end of each semester.

### b. Elective course
Elective courses are to be chosen with the approval of the Head of Department concerned from the list of elective courses mentioned in the curriculum.

### c. Project Work
The candidates shall undertake the project work in the Fourth Semester either in the Department concerned or in Industries, Institute or any other Organizations and the project report has to be submitted at the end of the fourth semester.

In case the candidate undertakes the project work outside the Department, the teacher concerned within the Department shall be the Main guide and the teacher/scientist under whom the work is carried out will be the Co-guide. The candidate shall bring the attendance certificate from the place of project work carried out.

### d. Value Added Courses

Courses of varying durations but not less than 30 hours which are optional and offered outside the curriculum that add value and help the students in for

getting placement. Students of all programmes are eligible to enroll for the Value Added Courses. The student shall choose one Value Added Course per semester from the list of Value Added Courses available in KAHE. The examinations shall be conducted at the end of the Value Added Course at the Department level and the student has to secure a minimum of 50% of marks to get a pass. The certificate for the Value Added Course for the passed out students shall be issued duly signed by the HOD and Dean of the Faculty concerned.

### e. Internship

The student shall undergo 15 days internship in the end of II semester. Internship report will be evaluated and awarded in the III semester. Students have to earn 2 credits for the Internship.100 marks is awarded for Internship through Continuous Internal Assessment.

### f. Open Elective

He / She may select one of the open elective courses from the list given below offered by the other department in the third semester. Students have to earn 2 credits for this course. (The student cannot select a course offered by the parent department).

| S.No. | Name of the Department | Course Code | Name of the Course |
|-------|------------------------|-------------|--------------------|
| 1 | M.A English | 22EGPOE301 | English for Competitive Examinations |
| 2 | M.Com | 22CMPOE301 | Personal Finance and Planning |
| 3 | MBA | 22MBAPOE301 | Organizational behavior |
| 4 | MCA | 22CAPOE301 | Robotics |
| 5 | M.Sc Computer Science | 22CSPOE301 | Cyber Forensics |
| 6 | M.Sc Mathematics | 22MMPOE301 | Coding theory |
| 7 | M.Sc Physics | 22PHPOE301 | Non-destructive techniques – an industrial approach |
| 8 | M.Sc Chemistry | 22CHPOE301 | Applying Chemistry to Society |
| 9 | M.Sc  Microbiology | 22MBPOE301 | Fermentation technology |
| 10 | M.Sc Biochemistry | 22BCPOE301 | Nutrition and Dietetics |
| 11 | M.Sc  Biotechnology | 22BTPOE301 | Plant Tissue culture and its applications |

### Online Course

Student shall study at least one online course from SWAYAM / NPTEL / MOOC in any one of the first three semesters for which examination shall be conducted at the end of the course by the respective external agencies if any. The student can register to the courses which are approved by the Department. The student shall produce a Pass Certificate from the respective agencies before the end of the third semester. The credit(s) earned by the students will

be considered as additional credit(s) over and above the credits minimum required to earn a particular Degree.

## 5. MEDIUM OF INSTRUCTION

The medium of instruction for all courses, examinations, seminar presentations and project/thesis/dissertation reports should be in English.

## 6. MAXIMUM MARKS

The maximum marks assigned to different courses shall be as follows:

**(i)** Each of the theory and practical courses shall carry maximum of 100 marks. Out of which 40 marks are for Continuous Internal Assessment (CIA) and 60 marks for End Semester Examinations (ESE).

**(ii) Maximum marks for Project work**

| S. No | Programme | Maximum marks | CIA | ESE |
|-------|-----------|---------------|-----|-----|
| 1 | M.Sc., M.Com., MA | 200 | 80 | 120 |

## 7. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

**a.** Ideally every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate is satisfactory during the course.

**b.** A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed minimum attendance requirements and shall be permitted to appear for the examination on the recommendation of the Head of Department concerned and Dean to condone the shortage of attendance. The Head of Department has to verify and certify the genuineness of the case before recommending to the Dean. However, the candidate has to pay the prescribed condonation fee to the KAHE.

**c.** However, a candidate who has secured attendance less than 64% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for

his/her supplementary examinations, if any and he/she has to re do the same semester with the approval of the "Students' Affairs Committee" and Registrar.

8. **a. FACULTY MENTOR**

To help students in planning their courses of study and for general advice on the academic programme, the HoD shall allot a certain number of students to a faculty who will function as mentor throughout their period of study. Faculty mentors shall advise the students and monitor their behavior and academic performance. Problems if any shall be counseled by them periodically. The Faculty mentor is also responsible to inform the parents of their wards progress. Faculty mentor shall display the cumulative attendance particulars of his / her ward students' periodically (once in 2 weeks) on the Notice Board to enable the students to know their attendance status and satisfy the **clause 7** of this regulation.

b. **ONLINE COURSE COORDINATOR**

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses which the students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinators shall advice the students regarding the online courses and monitor their course.

9. **CLASS COMMITTEE**

Every class shall have a Class Committee consisting of teachers of the class concerned, student representatives (Minimum two boys and 2 girls of various capabilities and Maximum of 6 students) and the concerned HoD / senior faculty as a Chairperson. The objective of the class committee Meeting is all about the teaching – learning process. Class Committee shall be convened at least once in a month. The functions of the Class Committee shall include

- Analyzing and Solving problems experienced by students in the class room and in the laboratories.

- Analyzing the performance of the students of the class after each test and finding the ways and means to improve the performance.

- The Class Committee of a particular class of any department is normally constituted by the HoD / Chairperson of the Class Committee. However, if the students of different departments are mixed in a class, the class committee shall be constituted by the respective faculty Dean.

- The Class Committee shall be constituted during the first week of each semester.

- The HoD / Chairperson of the class committee are authorized to convene the meeting of the class committee.

- The respective faculty Dean has the right to participate in any class committee meeting.

- The Chairperson is required to prepare the minutes of every meeting, and submit the same to Dean within two days after having convened the meeting. Serious issues if any shall be brought to the notice of the Registrar by the HoD / Chairperson immediately.

## 10. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group shall have a "Course Committee" comprising all the teachers handling the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Dean depending upon whether all the teachers handling the common course belong to a single department or to various other departments. The 'Course Committee' shall meet in order to arrive at a common scheme of evaluation for the tests to ensure a uniform evaluation of the tests. If feasible, the course committee shall prepare a common question paper for the Internal Assessment test(s).

## 11. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

11.1 Every Faculty is required to maintain an **Attendance and Assessment Record (Log book)** which consists of attendance of students marked for each lecture / practical / project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the HoD once in a fortnight for checking the syllabus coverage and records of test marks and attendance. The HoD shall sign with date   after due verification. The same shall be submitted to Dean once in a month. After the completion of the semester the HoD should keep this record in safe custody for five years. Because records of attendance and assessment shall be submitted for Inspection as and when required by the KAHE / any other approved body.

11.2 **Continuous Internal Assessment (CIA)**: The performance of students in each course will be continuously assessed by the respective faculty as per the guidelines given below:

**Theory Courses**

| S. No. | Category | Maximum Marks |
|:---:|:---|:---:|
| 1 | Attendance | 5 |
| 2 | Test – I (first 2 ½ units) | 10 |
| 3 | Test – II (last 2 ½ units) | 10 |
| 4 | Journal Paper Analysis & Presentation* | 15 |
| **Continuous Internal Assessment : Total** | | 40 |

**\***Evaluated by two faculty members of the department concerned. Distribution up of marks for one Journal paper analysis: Subject matter 5 marks, Communication/PPT Presentation 4 marks, Visual aid 2 marks and Question and Discussion 4 marks

**Practical Courses**

| S. No. | Category | Maximum Marks |
|:---:|:---|:---:|
| 1 | Attendance | 5 |
| 2 | Observation work | 5 |
| 3 | Record work | 5 |
| 4 | Model practical examination | 15 |
| 5 | *Viva – voce* [Comprehensive]* | 10 |
| **Continuous Internal Assessment: Total** | | **40** |

\* *Viva - voce* conducted during model practical examination.

Every practical Exercise / Experiment shall be evaluated based on the conduct of Exercise/ Experiment and records maintained.

11.3 **Pattern of Test Question Paper**

| Instruction | Remarks |
|---|---|
| Maximum Marks | 50 marks |
| Duration | 2 Hours |
| Part – A | Objective type (20x1=20) |
| Part - B | Short Answer Type (3 x 2 = 6) |
| Part - C | 3 Eight marks questions 'either – or' choice (3 x 8 = 24 Marks) |

**11.4 Attendance**

**Marks Distribution for Attendance**

| S. No. | Attendance (%) | Maximum Marks |
|---|---|---|
| 1 | 91 and above | 5.0 |
| 2 | 81 - 90 | 4.0 |
| 3 | 76 - 80 | 3.0 |
| 4 | Less than 75 | 0 |

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**12. ESE EXAMINATIONS**

**12.1  End Semester Examination (ESE)**: ESE will be held at the end of each semester for each course. The question paper is for a maximum of 60 marks.

Pattern of ESE Question Paper

| Instruction | Remarks |
|---|---|
| Maximum Marks | 60 marks for ESE |
| Duration | 3 hours (½ Hr for Part – A Online & 2 ½ Hours for Part – B and C) |
| Part – A | 20 Questions  of 1 mark each (20 x 1 = 20 Marks )<br>Question No. 1 to 20 Online Multiple Choice Questions |

| Instruction | Remarks |
|---|---|
| Part- B | 5 Questions of six marks each (5 x 6 = 30 Marks.)<br>Question No. 21 to 25 will be 'either-or' type, covering all five units of the syllabus; i.e.,<br>Question No. 21: Unit - I, either 21 (a) or 21 (b),   Question No. 22: Unit -  II, either 22 (a) or 22 (b), Question No. 23: Unit - III, either 23 (a) or 23 (b), Question No. 24: Unit - IV, either 24 (a) or 24 (b), Question No. 25: Unit - V, either 25 (a) or 25 (b) |
| Part - C | Question No.26. One Ten marks Question (1 x 10 = 10 Marks) |

12.2  **Practical:** There shall be combined valuation. The pattern of distribution of marks shall be as given below.

Experiments            : 40 Marks
Record                 : 10 Marks
*Viva-voce*            : 10 Marks
**Total**              **: 60 Marks**

**Record Notebooks for Practical Examination**
Candidate taking the Practical Examination should submit Bonafide Record Notebook prescribed for the Practical Examination, failing which the candidate will not be permitted to take the Practical Examination.

In case of failures in Practical Examination, the marks awarded for the Record at the time of first appearance of the Practical Examination shall remain the same at the subsequent appearance also by the candidate.

12.3. **Evaluation of Project Work**

12.3.1 The project shall carry a maximum marks as per clause 6 (ii). ESE will be a combined evaluation of Internal and External Examiners.

12.3.2 The project report is prepared according to the approved guidelines and duly signed by the supervisor(s) shall be submitted to HoD.
Guidelines to prepare the project report
a. Cover page
b. Bonafide certificate
c. Declaration
d. Acknowledgement
e. Table of contents
f. Chapters
Introduction

Aim and Objectives
Materials and Methods (Methodology)
Results (Analysis of Data) and Discussion (Interpretation)
Summary
References

12.3.3 The evaluation of the project will be based on the project report submitted and *Viva-Voce* Examination by a team consisting of the supervisor, who will be the Internal Examiner and an External Examiner who shall be appointed by the COE. In case the supervisor is not available, the HoD shall act as an Internal Examiner.

12.3.4 If a candidate fails to submit the project report on or before the specified date given by Examination Section, the candidate is deemed to have failed in the project work and shall re-enroll for the same in a subsequent semester.

If a candidate fails in the *viva-voce* examinations he/she has to resubmit the project report within 30 days from the date of declaration of the results. For this purpose the same Internal and External examiner shall evaluate the resubmitted report.

12.3.5 Copy of the approved project report after the successful completion of *viva voce* examinations shall be kept in the KAHE library.

## 13. PASSING REQUIREMENTS

13.1 Passing minimum: There is a passing minimum 20 marks out of 40 marks for CIA and the passing minimum is 30 marks out of 60 marks in ESE. The overall passing in each course is 50 out of 100 marks (Sum of the marks in CIA and ESE examination).

13.2 If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 13.1, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till he/she secures a pass both in CIA and ESE (vide Clause 2.1).

13.3 Candidate failed in CIA will be permitted to improve CIA marks in the subsequent semesters by writing tests and by re-submitting assignments.

13.4 CIA marks (if it is pass) obtained by the candidate in the first appearance shall be retained by the Office of the Controller of Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE.

13.5 A candidate who is absent in ESE in a Course / Practical / Project work after having enrolled for the same shall be considered to have **failed** in that examination.

## 14. IMPROVEMENT OF MARKS IN THE COURSE   ALREADY PASSED

Candidates desirous to improve the marks secured in a passed course in their first attempt shall reappear once (**only in ESE**) in the subsequent semester. **The improved marks shall be considered for classification but not for ranking.** If there is no improvement there shall be no change in the marks awarded earlier.

## 15. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

| Letter grade | Marks Range | Grade Point | Description |
|---|---|---|---|
| O | 91 - 100 | 10 | OUTSTANDING |
| A+ | 81- 90 | 9 | EXCELLENT |
| A | 71-80 | 8 | VERY GOOD |
| B+ | 66- 70 | 7 | GOOD |
| B | 61 – 65 | 6 | ABOVE AVERAGE |
| C | 55 - 60 | 5 | AVERAGE |
| D | 50 - 54 | 4 | PASS |
| RA | <50 | - | REAPPEARANCE |
| AAA | - | - | ABSENT |

## 16.  GRADE SHEET

After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:

i.    The list of courses enrolled during the semester and the corresponding grade scored.

ii.   The Grade Point Average (**GPA**) for the semester and

iii.  The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

GPA of a Semester and CGPA of a programme will be calculated as follows.

$$\textbf{GPA} \text{ of a Semester} = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that Semester}}{\text{Sum of the credits of the courses of that Semester}}$$

i.e. **GPA** of a Semester = $\dfrac{\sum\limits_{i} CiGPi}{\sum\limits_{i} Ci}$

$$\textbf{CGPA} \text{ of the entire programme} = \frac{\text{Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

i.e. **CGPA** of the entire programme = $\dfrac{\sum\limits_{n}\sum\limits_{i} CniGPni}{\sum\limits_{n}\sum\limits_{i} Cni}$

where,

Ci is the credit fixed for the course 'i' in any semester

GPi is the grade point obtained for the course 'i' in any semester

'n' refers to the Semester in which such courses are credited

**Note: RA** grade will be excluded for calculating **GPA** and **CGPA**.

## 17. REVALUATION

Candidate can apply for revaluation and retotalling of his / her semester examination answer script (**theory courses only**), within 2 weeks from the date of declaration of results, on payment of a prescribed fee. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of Examinations will arrange for the revaluation and results will be intimated to the candidate through the HODs concerned**.** Revaluation is not permitted for supplementary theory courses.

## 18. TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling is allowed on representation (clause 17). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wish. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the KAHE), the HoD of Department concerned, the faculty of the course and Dean from other discipline nominated by the KAHE and the CoE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

## 19. ELIGIBILITY FOR THE AWARD OF THE DEGREE

**A student shall be declared to be eligible for the conferment of the Degree if he / she has**

- Successfully completed all the components in clause 3 and gained the required number of total credits as specified in the curriculum corresponding to his / her Programme within the stipulated period.
- Not any disciplinary action pending against him / her.
- The award of the degree must be approved by the Board of Management.

## 20. CLASSIFICATION OF THE DEGREE AWARDED

20.1 Candidate who qualifies for the award of the Degree (vide clause 13) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8.0** shall be declared to have passed the examination in **First Class with Distinction.**

20.2 Candidate who qualifies for the award of the Degree (vide clause 13) having passed the examination in all the courses within the specified maximum number of semesters (vide clause 2.1), securing a **CGPA not less than 6.5** shall be declared to have passed the examination in **First Class**.

20.3 All other candidates (not covered in clauses 20.1 and 20.2) who qualify for the award of the degree (vide Clause 19) shall be declared to have passed the examination in **Second Class**.

## 21. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

21.1 A candidate due to valid reason on prior application may be granted permission to withdraw from appearing for the examination of any one

course or consecutive examinations of more than one course in a semester examination.

21.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

21.3 Withdrawal of application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the HoD / Dean concerned and approved by the Registrar.

21.3.1 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

21.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during IV semester.

21.5 Withdrawal from the End semester examination is **NOT** applicable to arrears courses of previous semesters.

21.6 The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

## 22. PROVISION FOR AUTHORISED BREAK OF STUDY

22.1 **Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme.** However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar, but not later than the last date for registering for the end semester examination of the semester in question, through the HoD stating the reasons therefore and the probable date of rejoining the programme.

22.2 The candidate thus permitted to rejoin the Programme after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the Regulations in force at that period of time.

22.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide Clause 20). However, additional break of study granted will be counted for the purpose of classification.

22.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2.1 irrespective of the period of break of study (vide clause 22.3) in order that he/she may be eligible for the award of the degree.

22.5 If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' or 'Withdrawal' (Clause 21 and 22) is not applicable for this case.

## 23. RANKING

A candidate who qualifies for the PG Degree programme passing all the Examinations in the first attempt, within the minimum period prescribed for the programme of study from Semester I through Semester IV to the programme shall be eligible for ranking. Such ranking will be confined to 10% of the total number of candidates qualified in that particular programme of Study subject to a maximum of 10 ranks.
**The improved marks will not be taken into consideration for ranking.**

## 24. SUPPLEMENTARY EXAMINATION

Supplementary Examination will be conducted only for the final semester students within ten days from the date of publication of results for students who have failed in one theory course only. Such students shall apply with prescribed fee to the Controller of Examinations within the stipulated time.

## 25. DISCIPLINE

25.1. If a student indulges in malpractice in any of the Internal / External Examinations he / she shall be liable for punitive action as prescribed by the KAHE from time to time.

25.2. Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the KAHE. The erring students will be referred to the disciplinary committee constituted by the KAHE, to enquire into acts of indiscipline and recommend the disciplinary action to be taken.

## 26. REVISION OF REGULATION AND CURRICULUM

Karpagam Academy of Higher Education may from time to time revise, amend or change the Regulations, Scheme of Examinations and syllabi if found necessary.

**PROGRAM OUTCOMES:** Post Graduate student of Computer Science programme will be able to

 a. Apply basic concepts of Computer Science to effectively involve in the research.
 b. Design software to meet required needs with realistic constraints such as economical, environmental, social, ethical and sustainable in the field of Computer Science.
 c. Design and conduct experiments as well as to analyze, interpret data on experiments relevant to Computer Science practice.
 d. implement software designs to provide working solutions, including use of appropriate programming languages, web-based systems and tools, design methodologies, and database systems
 e. To attain in depth knowledge and understanding the principles of programming for applying in broad range of languages and open source platforms.
 f. use IT skills and display mature computer literacy
 g. Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to computer science practice.
 h. Communicate effectively on complex research issues with research community and society, such as, being able to comprehend, write effective reports, design documentation and make effective presentations with clear instructions.
 i. Demonstrate knowledge and understanding of the computer science and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
 j. Recognize the need for ability to engage in independent and life-long learning.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

 k. Exhibit an outstanding association and active contribution in their professional including entrepreneurship using the information in Computer Science.
 l. Contribute effectively as a team member/leader using common tools and adopt latest technologies in education and solve real world problems.
 m. Pursue life-long learning and research in specific fields of Computer Science and develop novel and research oriented methodologies in an effectivemanner.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO I:**Understand analyze and develop computer programs in the areas related to Database systems and Big data Analytics, cloud computing, soft computing, IoT, Image processing, Green computing, web designing, mobile computing and networking for efficient design of computer based system of varying complexity.

**PEO II:**Apply standard software Engineering practices and strategies in software project development using open-source programming environment to deliver a quality for business success.

**PEO III:**Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

# MAPPING of PEOs and POs

| POs | a | b | c | d | e | f | g | h | i | j | k | l | m |
|------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PEO1 | X |   | X | X | X | X |   |   | X | X |   | X | X |
| PEO2 | X | X | X | X | X | X | X | X |   |   | X | X |   |
| PEO3 | X |   | X | X | X | X |   |   | X | X | X |   | X |

# DEPARTMENT OF COMPUTER SCIENCE
## FACULTY OF ARTS, SCIENCE, COMMEREC AND MANAGEMENT
## PG PROGRAM (CBCS) – M.Sc. Computer Science
## (2022–2023 Batch and onwards)

| Course code | Name of the course | Objectives and out comes | | Instruction hours / week | | | Credit(s) | Maximum Marks | | | Page No |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PEOs | POs | L | T | P | | CIA | ESE | Total | |
| | | | | | | | | 40 | 60 | 100 | |
| **SEMESTER – I** | | | | | | | | | | | |
| 22CSP101 | Python Programming | I | c,d | 4 | - | - | 4 | 40 | 60 | 100 | 1 |
| 22CSP102 | Big Data Analytics | I | a,g | 4 | - | - | 4 | 40 | 60 | 100 | 3 |
| 22CSP103 | Cryptography and Network Security | I | b,c | 4 | - | - | 4 | 40 | 60 | 100 | 5 |
| 22CSP104 | Cloud Computing | III | b,g | 4 | - | - | 4 | 40 | 60 | 100 | 7 |
| 22CSP105A/ 22CSP105B/ 22CSP105C | Wireless and Mobile Computing / Geographical Information Systems / Soft Computing | I | b | 4 | - | - | 4 | 40 | 60 | 100 | 9 |
| | | III | g | | | | | | | | 11 |
| | | II | c | | | | | | | | 13 |
| 22CSP111 | Python Programming - Practical | I | c,d | - | - | 4 | 2 | 40 | 60 | 100 | 15 |
| 22CSP112 | Big Data Analytics - Practical | I | b,c | - | - | 4 | 2 | 40 | 60 | 100 | 17 |
| Journal Paper Analysis & Presentation | | III | h | 2 | - | - | - | **-** | **-** | **-** | **-** |
| **Semester Total** | | **-** | **-** | 22 | - | 8 | 24 | 280 | 420 | 700 | - |
| **SEMESTER – II** | | | | | | | | | | | |
| 22CSP201 | Internetworking with TCP/IP | I | c | 4 | - | - | 4 | 40 | 60 | 100 | 19 |
| 22CSP202 | Cyber Security | I | b,g | 4 | - | - | 4 | 40 | 60 | 100 | 21 |
| 22CSP203 | MongoDB | II | d | 4 | - | - | 4 | 40 | 60 | 100 | 24 |
| 22CSP204 | Internet of Things | I | b | 4 | - | - | 4 | 40 | 60 | 100 | 26 |
| 22CSP205A/ 22CSP205B/ 22CSP205C | Artificial Intelligence/ Machine Learning/ Deep Learning | III | b,g | 4 | - | - | 4 | 40 | 60 | 100 | 28 |
| | | III | b,g | | | | | | | | 30 |
| | | III | b,g | | | | | | | | 32 |
| 22CSP211 | Router Configuration – Practical | I | c | - | - | 4 | 2 | 40 | 60 | 100 | 34 |
| 22CSP212 | MongoDB – Practical | II | d | - | - | 4 | 2 | 40 | 60 | 100 | 36 |
| Journal Paper Analysis & Presentation | | III | h | 2 | - | - | - | - | - | - | - |
| **Semester Total** | | **-** | **-** | 22 | - | 8 | 24 | 280 | 420 | 700 | - |

**Semester-I**

**22CSP101**                  **PYTHON PROGRAMMING**                  **4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0     Marks:** Internal: **40**   External: **60**Total: **100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To understand the theoretical foundations and algorithms
- To understand the methodologies of Neural Network
- To design and develop an application using specific deep learning models
- To provide the practical knowledge in handling and analyzing real world applications
- To Introduce different types of Deep Architectures
- To provide an understanding of Convolutional Networks and Recurrent Networks

**Course Outcomes (COs)**

On successful completion of the course the student should be able to:

1. Recognize the characteristics of deep learning models that are useful to solve real-world problems.
2. Understand different methodologies to create application using deep nets.
3. Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.
4. Implement different deep learning algorithms
5. Design the test procedures to assess the efficacy of the developed model.
6. Combine several models in to gain better results

**Unit I - MACHINE LEARNING BASICS**

Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient decent, Curse of Dimensionality.

**Unit II - DEEP LEARNING ARCHITECTURES**

Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications.

### Unit III - CONVOLUTIONAL NEURAL NETWORKS

Architectural Overview,Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet – Applications. Transfer Learning: Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet.

### Unit IV - SEQUENCE MODELLING - RECURRENT AND RECURSIVE NETS

Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short Term Memory Networks.

### Unit V - AUTO ENCODERS AND DEEP GENERATIVE MODELS

Deep Belief networks, Boltzmann Machines,Deep Boltzmann Machine, Generative Adversial Networks. Recent Trends.

### SUGGESTED READINGS

1. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy. (2018).Deep Learning with TensorFlow: Explore neural networks with Python. Packt Publisher.
2. Antonio Gulli, Sujit Pal .(2017).Deep Learning with Keras. Packt Publishers.
3. Francois Chollet.(2017). Deep Learning with Python, Manning Publications.
4. Ethem Alpaydin.(2016). Introduction to Machine Learning, 3rd Edition. MIT Press, Prentice Hall of India.
5. Kevin P. Murphy. (2015). Machine Learning: A Probabilistic Perspective, The MIT Press.

### WEB SITES

1. https://www.mygreatlearning.com/
2. https://www.mathworks.com/discovery/deep-learning.html
3. https://machinelearningmastery.com/what-is-deep-learning/
4. https://www.ibm.com/cloud/learn/deep-learning

### JOURNALS

1. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018.

**22CSP102**                     **BIG DATA ANALYTICS**                     **4H – 4C**
**Instruction Hours / week:L: 4 T: 0 P: 0**     **Marks:** Internal:**40**  External:**60** Total: **100**
                                                                  **End Semester Exam :** 3 Hours

**Course Objectives**
- To provides grounding in basic and advanced methods to big data technology and tools like MapReduce and Hadoop and its ecosystem.
- To Understand the Big Data Platform and web analytics
- To Provide an overview of Apache Hadoop and  Design of HDFS
- To Understand Map Reduce features
- To Provide hands on Hbase, Pig and HiveQL queries
- To Introduce to NoSQL and Data Model
- To Exposethe Graph databases Neo4J

**Course Outcomes(COs)**
On successful completion of the course the student should be able to:
1. Apply Hadoop ecosystem components.
2. Access and Process Data on Hbase, Pig and HiveQL queries
3. Manage Job Execution in Hadoop Environment
4. Analyze Map Reduce Types
5. Apply Data Model and Connect your data and Dashboard
6. Participate data science and big data analytics projects

**Unit I – INTRODUCTION TO BIG DATA**
What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies - open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

**Unit II -HISTORY OF HADOOP**
Understanding Hadoop Ecosystem -The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS- How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures- - Map Reduce Types and Formats- Map Reduce Features

**Unit III - HBASE**
Data model and implementations – Hbase clients – Hbase examples – praxis. Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing  Pig Latin scripts..

**Unit IV - INTRODUCTION TO NOSQL**
Aggregate data models – aggregates – key-value and document data models – relationships– schemaless databases – materialized views – distribution models -peer-peer replication –

consistency – relaxing consistency – version stamps – partitioning and combining – composing map-reduce calculations -Document based Database – CAP theorem - MongoDB- Introduction-Data Model- Working with data- Replication &Sharding- Development

## Unit V - GRAPH DATABASES NEO4J
Key concept and characteristics-Modelling data for neo4j- Importing data into neo4j-Visualizations neo4j-Cypher Query Language-Data visualization- Creating Visual analytics with Tableau-Connecting your data-Creating Calculation-Using maps-Dashboard-Stories

## SUGGESTED READINGS
1. Daniel G.Murray. (2018). Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software. 2nd Edition. Wiley.
2. Joshua N. Milligan. (2016). Learning Tableau. Packt Publishing Ltd. UK
3. Tom White. (2015).The Definitive Guide to Mongodb. 4th Edition. OReilly.
4. Rik Van Bruggen. (2015). Learning Neo4j. 1st Edition. Packt Publishing Ltd. UK.
5. GauravVaish. (2015). Getting Started with NoSQL.  Packt Publishing Ltd. UK.
6. Pramod J. Sadalage, Martin Fowler. (2015). NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Pearson Education.
7. Tom White. (2015). Hadoop: The Definitive Guide. 2nd Edition. OReilly.
8. Dirk deRoos, Paul Zikopoulos, Bruce Brown, Roman B. Melnyk,RafaelCoss. (2015). Hadoop For Dummies.

## WEB SITES
1. https://www.tutorialspoint.com/big_data_analytics/
2. hadoop.apache.org/
3. https://www.mongodb.com/nosql-explained
4. https://neo4j.com/
5. https://nptel.ac.in/courses/106104189/

## JOURNALS
1. Reihaneh H. Hariri, Erik M. Fredericks & Kate M. Bowers ,” **Uncertainty in big data analytics: survey, opportunities, and challenges**”, *Journal of Big Data* volume **6**, Article number: 44 (2019)

**Semester-I**
**22CSP103**     **CRYPTOGRAPHY AND NETWORK SECURITY**     **4H – 4C**
**Instruction Hours / week:L: 4 T: 0 P: 0**     **Marks:** Internal:**40** External:**60** Total: **100**
                              **End Semester Exam :** 3 Hours **Course**

## Course Objectives
This course will provide students with a theoretical knowledge to understand the fundamental principles of access control models and techniques and,
- To understand theory of fundamental cryptography, encryption and decryption algorithms
- To know about various encryption techniques.
- To understand various Block Ciphers, DES and AES algorithms
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on web security, electronic mail security, firewalls

## Course Outcomes (COs)
On successful completion of the course the student should be able to:
1. Classify the symmetric encryption techniques
2. Illustrate various Public key cryptographic techniques
3. Evaluate the authentication and hash algorithms.
4. Summarize the intrusion detection and its solutions to overcome the attacks.
5. Understand basic concepts of system level security
6. Build secure authentication systems by use of message authentication techniques.

## Unit I - INTRODUCTION
Security Trends - The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security. Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques - Transposition Techniques – Rotor Machines - Steganography.

## Unit II-BLOCK CIPHERS AND DATA ENCRYPTION STANDARD
Block Cipher Principles – The Data Encryption Standard - The Strength of DES –Advanced Encryption Standard (AES) – Evaluation Criteria for AES – The AES Cipher – Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream Ciphers and RC4- modular Arithmetic and Euclidean Algorithm.

## Unit III - CONFIDENTIALITY USING SYMMETRIC ENCRYPTION
Placement of Encryption Function – Traffic Confidentiality – Key Distribution – Public key Cryptography and RSA – Principles of Public Key Cryptosystems – The RSA Algorithm- Basic prime numbers and Discrete Logarithms **-**Key Management – Diffie Hellman Key Exchange.

## Unit IV - MESSAGE AUTHENTICATION AND HASH FUNCTIONS
Authentication Functions – Message Authen tication Codes (MAC's) Functions – Security of Hash Functions and MAC's Digital Signatures and Authentication Protocols – Digital Signatures – Digital Signature Standard

**Unit V - WEB SECURITY , ELECTRONIC MAIL SECURITY, FIREWALLS**

Web Security Requirements; Secure Socket Layer (SSL) – SSL Architecture, SSL Protocol; Transport Layer Security (TLS); Secure Electronic Transaction (SET) – Features, Components, Dual Signature, Purchase Request. Electronic Mail Security: Threats to E-Mail; Requirements and Solutions – Confidentiality, Integrity; Encryption for Secure E-Mail; Secure E-Mail System – PGP (Pretty Good Privacy), S/MIME (Secure Multipurpose Internet Mail Extensions). Firewalls – Types – Packet Filtering Gateway, Stateful Inspection Firewall, Application Proxy, Guard, Personal Firewalls; Comparison of Firewall Types; Firewall Configurations.

**SUGGESTED READINGS**

1. Atul Kahate. (2019). Cryptography and Network Security. 4th Edition.Tata McGraw Hill. New Delhi.
2. Charlie Kaufman, Radia Perlman, & Mike Speciner. (2017). Network Security Private Communication in a Public World. 2nd Edition. Prentice-Hall of India. New Delhi.
3. William Stallings. (2017).Cryptography and Network Security Principles and Practices. 6th Edition. Pearson Education. New Delhi.
4. John F. Dooley.(2016). History of Cryptography and Cryptanalysis: Codes, Ciphers, and Their Algorithms. Springer.

**WEB SITES**

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. cryptofundamentals.com/algorithms
4. https://www.tutorialspoint.com/cryptography/index.htm
5. https://nptel.ac.in/courses/106105162/

**JOURNALS**

1. Yahia Alemami, Mohamad Afendee Mohamed, Saleh Atiewi, **Research on Various Cryptography Techniques**, International Journal of Recent Technology and Engineering (IJRTE), Volume-8, Issue-2S3, July 2019

**Semester-I**

| 22CSP104 | CLOUD COMPUTING | 4H – 4C |

**Instruction Hours / week:L: 4 T: 0 P: 0     Marks:** Internal:**40** External:**60** Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**
- To Provide a good understanding of the concepts, standards in Cloud computing
- To make the student understand about the cloud service providers and their usage.
- To learn how to secure the data in cloud depending.
- To understand the various service level agreements.
- To understand the cloud using various case studies.
- To portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.

**Course Outcomes (COs)**

Upon completion of this course the students will be able to:
1. Portray the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.
2. Know the architecture of the cloud and the usage of clouds.
3. Secure their data from the security issues.
4. Make the students to work based on the various service level agreements.
5. Work with the traditional cloud and Microsoft azure, etc.
6. Provide a good understanding of the concepts, standards and protocols in Cloud computing

**Unit I - INTRODUCTION TO CLOUD COMPUTING**

Characteristics of Cloud Computing -Paradigm shift - Benefits of cloud computing - Disadvantages of cloud computing- Role of Open Standards-Cloud Computing Architecture: Cloud computing stack-Public cloud -Private cloud -Hybrid cloud -Community cloud

**Unit II – SERVICE MODELS**

Infrastructure as a Service (IaaS) -Platform as a Service (PaaS) -Software as a Service (SaaS) - Identity as a Service (IDaaS) -Compliance as a Service (CaaS)- Cloud storage- Advantages of Cloud Storage – Cloud Storage Providers.

**Unit III - VIRTUALIZATION TECHNOLOGIES**

Load Balancing and Virtualization -Advanced load balancing -The Google cloud - Hypervisors - Virtual machine types -VMware vSphere - Machine Imaging -Porting Applications -The Simple Cloud API - AppZero Virtual Application Appliance. Virtualization of CPU –Memory – I/O Devices –Virtualization Support and Disaster Recovery.

**Unit IV - CLOUD INFORMATION SECURITY OBJECTIVES**

Confidentiality Integrity and Availability -Cloud Security Services - Relevant Cloud Security Design Principles -Cloud Computing Risk Issues -The CIA Triad

Privacy and Compliance Risks -Threats to Infrastructure Data and Access Control -Cloud Access Control Issues -Database Integrity Issues -Cloud Service Provider Risks Architectural

Considerations General Issues- Trusted Cloud Computing -Identity Management and Access Control

**Unit V – CASE STUDIES**
Case Study on Open Source and Commercial Clouds: Microsoft Azure- Amazon EC2-Google Web services – Open Nebula.

**SUGGESTED READINGS**
1. Dr Kumar Saurabh.(2018). Cloud Computing .2$^{nd}$ editon. New Delhi: Wiley India.
2. Nikos Antonopoulos, Lee Gillam. (2018). Cloud Computing: Principles Systems and Applications . Springer.
3. Giovanni Toraldo. (2017). Open Nebula 3 Cloud Computing.
4. Barrie Sosinsky .(2017). Cloud Computing Bible .Wiley- India. New Delhi
5. Rajkumar Buyya, James Broberg, & Andrzej, M. Goscinski. (2017). New Delhi: Tata Mc-Graw Hill.
6. Ronald, L. Krutz, Russell Dean Vines. (2016). Cloud Security: A Comprehensive Guide to Secure Cloud Computing. New Delhi: Wiley –India
7. Anthony T.Velte Toby J.Velte Robert Elsenpeter. (2016). Cloud Computing Practical Approach (1st ed.). New Delhi:Tata McGraw Hill.

**WEBSITES**
1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx
5. https://nptel.ac.in/courses/106105167/

**JOURNALS**
1. K.Naresh, P.Leela, P.Suneetha, Purandhar.N ,” **Research on Cloud Computing By using SaaS Model** “,International Journal of Recent Technology and Engineering (IJRTE), Volume-8, Issue-1S4, June 2019

                                                                                              **Semester-I**

**22CSP105A**        **WIRELESS AND MOBILE COMPUTING**          **4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0**     **Marks:** Internal:**40** External:**60** Total: **100**

                                              **End Semester Exam :** 3 Hours

**Course Objectives**
- To learn about the concepts and principles of mobile computing;
- To explore both theoretical and practical issues of mobile computing;
- To develop skills of finding solutions and building software for mobile computing applications.
- To identify the use of mobile wireless technologies
- To know the types of mobile wireless technologies that are currently being used
- To understand the working of mobile wireless technologies access to network resources.

**Course Outcomes (COs)**
1. Grasp the concepts and features of mobile computing technologies and applications
2. Have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support
3. Identify the important issues of developing mobile computing systems and applications
4. Organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities;
5. Develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools;
6. Organize and manage software built for deployment and demonstration.

**Unit I - MOBILE COMPUTING APPLICATIONS AND PLATFORMS**
Introduction – Strengths and Weakness of Wireless – Applications – Platforms to support Mobile Computing Applications –Wireless Networks – Wireless Architecture Security and Management – Wireless Business

**Unit II - MOBILE COMPUTING APPLICATIONS**
Key Characteristics of Mobile Applications – Messaging for users – Mobile Portals – Special Applications – Mobile agent applications

**Unit III - WIRELESS INTERNET MOBILE IP AND WIRELESS WEB**
Internet and Web – How it works –  Mobile IP – WWW for wireless – Mobile Web Services - **Mobile Computing Platforms** - Introduction – Wireless Middleware – Wireless Gateways and Mobile Application Servers – WAP – I-MODE Wireless JAVA MMIT and BREW – Voice communication

**Unit IV -WIRELESS LANS**
IEEE 802.11 – MANET – HiperLAN2 - **Wireless Personal AreaNetworks** - IEEE 802.15 – Home Networks – Blue tooth LANs - Target Detection and Tracking – **Cellular Networks** - Principles – First Generation(1G) Cellular – Paging networks – Second Generation(2G) Cellular – Data over Cellular Networks – Third Generation Cellular (3G) Networks – 4G-Beyond 4G.

**Unit –V –WIRELESS SENSOR NETWORKS**
WSN-Applications-Architecture of Sensor Node- Characteristics of sensor networks-WSN routing Protocols.

**SUGGESTED READINGS**
1. Clint Smith and Daniel Collins (2018), Wireless Networks, 3rd edition, Tata McGraw Hill .
2. Eldad Perahia & Robert Stacey (2017) Next Generation Wireless LANs 802.11n and 802.11 a, 2nd Edition, Cambridge University Press.
3. Michael Miller (2017), Wireless Networking Absolute Beginner's Guide, Pearson Education.
4. Ashok, K.Talukder,& Roopa, R. Yavagal. (2017). Mobile Computing. Tata Mc-Graw Hill Publishing Company Pvt Ltd .New Delhi.
5. Mischa Schwartz. (2016). Mobile Wireless Communications. Cambridge University Press.
6. Amjad Umar. (2016). Mobile Computing and Wireless Communication – Applications Networks Platforms Architecture and Security. NGE Solutions INC. New York: (Page Nos: 1.1- 1.52 2.3 – 2.51 3.2 – 3.37 4.3-4.51 6.16-6.36 7.3-7.33 8.4-8.39)
7. Jack, M. Holtzman, & David, J. Goodman. (2015). Wireless and Mobile Communications. Kluwer Academic Publishers.

**WEB SITES**
1. http://www.networkcomputing.com/netdesign/wireless1.html
2. http://www.homeandlearn.co.uk/bc/beginnerscomputing.html
3. http://compnetworking.about.com/
4. http://www.compinfo.co.uk/computer_books.htm#tele
5. https://nptel.ac.in/courses/106/106/106106147/

**JOURNALS**
1. Zhongli Wang , Shuping Dang , SinaShaham , Zhenrong Zhang, And Zhihan LV , **Basic Research Methodology in Wireless Communications: The First Course for Research-Based Graduate Students**, IEEE Access, 2019

                                                       **Semester-I**

**22CSP105B**     **GEOGRAPHICAL INFORMATION SYSTEMS**        **4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0**    **Marks:** Internal:**40** External:**60** Total: **100**

                                            **End Semester Exam :** 3 Hours

**Course Objectives**

- To gain a basic, practical understanding of GIS concepts, techniques.
- To analyse the basic components of GIS
- To classify the maps, coordinate systems and projections
- To process spatial and attribute data and prepare thematic maps
- To identify and rectify mapping inaccuracies
- To formulate and solve geospatial problems

**Course Outcomes(COs)**

At the completion of the course, students will:

1. Have a basic, practical understanding of GIS concepts, techniques and real world applications.
2. Have an understanding of the technical language of GIS.
3. Know how GIS is utilized in the larger context of business needs and IT strategies. Understand the basic concepts of geography necessary to efficiently and accurately use GIS technology.
4. Understand basic GIS data concepts.
5. Have an ability to perform basic GIS analysis of concepts. .
6. Have an understanding of GIS and its relationship to mapping software development. Have an appreciation of GIS career options and how to pursue

**Unit I – INTRODUCTION**

What is a Geographical Information Systems (GIS) – Geographically referenced data – Components of a GIS – Hardware, Software, Data, People, Methods  GIS operations – Geographic Coordinate systems – Vector and raster systems. Scale, resolution, map projection – Commonly used Map Projections – Projected Coordinate Systems – Working with Coordinate systems in GIS.

**Unit II - GEORELATIONAL VECTOR DATA MODEL**

Georeferencing & Global Positioning Systems (GPS)-Georelational data model – Representation of simple features – Topology – Nontopological Vector data – Data models for composite features. Consistency – Non topological file  formats

Object based vector data model – Object based data model – The geodatabase data model – Interface – Topology rules – Advantages of Geodatabase model.

**Unit III - RASTER DATA MODEL**

Elements of Raster Data Model - Raster Data Structure – Data Compression – Data Conversion – Integration of Raster and Vector Data.

Data Input – Existing GIS data – Meta Data – Conversion of Existing Data – Creating New Data-TIN and GRID data models.

**Unit IV - GEOMETRIC TRANSFORMATION**
Root Mean Square (RMS) Error – Interpretation of RMS errors Digitized Maps – Re sampling of Pixel Values.Spatial Data Editing – Location Errors – Spatial Data Accuracy Standards – Topological Errors – Topological Editing – Nontopological Editing – Other Editing operations

**Unit V - DATA DISPLAY AND CRYPTOGRAPHY**
Cartographic Symbolization – Types of Maps – Typography – Map Design – Map Production. Data Exploration – Attribute and Data Query – Spatial Data Query – Raster Data Query – GIS Applications- Introduction to Integration of Geo-database and Social networking applications.

**SUGGESTED READINGS**
1. Paul Bolstad (2018), GIS Fundamentals: A First Text on Geographic Information Systems, 5th Edition
2. Wilpen L. Gorr and Kristen S. Kurland (2017), GIS Tutorial 1: Basic Workbook, 6th edition., Esri Press.
3. Kang-tsung Chang. (2017). Introduction to Geographic Information Systems . 3rd edition. Tata McGraw-Hill. New Delhi.
4. Ian Heywood., Sarah Cornelius., Steve Carver.,& Srinivasa Raju. (2016). An introduction to Geographical Information Systems. 2nd edition. Pearson Education. New Delhi

**WEB SITES**
1. https://gisgeography.com
2. https://www.satimagingcorp.com/services/geographic-information-systems
3. https://www.caliper.com/maptitude/gis_software
4. https://nptel.ac.in/courses/105107155/

**JOURNALS**
1. Quartulli M, Olaizola GI. **A review of EO image information mining**. ISPRS Journal of Photogrammetry and Remote Sensing. 2013;75:11–28.

                                                         **Semester-I**

**22CSP105C**             **SOFT COMPUTING**                            **4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0**     **Marks:** Internal:**40** External:**60** Total: **100**

                                       **End Semester Exam :** 3 Hours

## Course Objectives

- To understand the scope and evolution of soft computing
- To learn the various soft computing frame works
- To be familiar with design of various neural networks
- To be exposed to fuzzy sets and fuzzy logic
- To understand fuzzy measures and reasoning
- To learn genetic programming.

## Course Outcomes(COs)

1. Understand the scope and evolution of soft computing
2. Learn the various soft computing frame works
3. Be familiar with design of various neural networks
4. Be exposed to fuzzy sets and fuzzy logic
5. Understand fuzzy measures and reasoning
6. Learn genetic programming.

## Unit I - INTRODUCTION

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence – Neural Networks - Scope and Evolution– Models of Neural Networks – Feed forward Networks – Supervised Learning Neural Networks – Associative memory networks – Unsupervised learning networks – Special Networks.

## Unit II - FUZZY SETS AND FUZZY LOGIC

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations - Fuzzy Rules Non – interactive fuzzy sets – Fuzzification— Defuzzification – Operations on Fuzzy sets.
Fuzzy relations, rules, propositions, implications and inferences. Fuzzy logic controller design - Some applications of Fuzzy logic.

## Unit III - FUZZY MEASURES AND REASONING

Fuzzy arithmetic and measures – Fuzzy reasoning – approximate reasoning – categorical qualitative syllogistic dispositional – Fuzzy inference systems – fuzzy decision making – individual multiperson multi objective Bayesian.

## Unit IV - MACHINE LEARNING AND GENETIC ALGORITHM

Machine Learning Techniques – Machine Learning Using Neural Nets – Genetic Algorithms (GA) – Simple and General GA – Classification of Genetic Algorithm – Messy Adaptive Hybrid Parallel – Holland Classifier System.

## Unit V -APPLICATION AND IMPLEMENTATION SOFT COMPUTING

Genetic algorithms:History of Genetic Algorithms (GA), Working Principle, Various Encoding methods-. Traveling Salesperson Problem- Internet Search Techniques – Fuzzy Controllers –

Bayesian Belief networks for Rocket Engine Control – Neural Network Genetic algorithm and Fuzzy logic implementation in C++ and Matlab.

**SUGGESTED READINGS**

1. Samir Roy (2018), Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms,1st Edition, Pearson Education
2. Shai Shalev-Shwartz and Shai Ben-David (2018), Understanding Machine Learning: From Theory to Algorithms, Cambridge Universtiy Press.
3. Sivanandam , S.N.,& Deepa, S.N. (2017). Principles of Soft Computing. $1^{st}$ edition. Wiley India Ltd. New Delhi
4. 1.Jyh-Shing, Roger Jang, Chuen-Tsai, & Sun EijiMizutani. (2017). Neuro-Fuzzy and Soft Computing.Prentice-Hall of India , New Delhi
5. James, A. Freeman & David, M. Skapura. (2016).Neural Networks Algorithms Applications and Programming Techniques. Pearson Education. New Delhi:
6. George, J. Klir, &  Bo Yuan. (2016). Fuzzy Sets and Fuzzy Logic-Theory and Applications.Prentice Hall. New Delhi:
7. Amit Konar. (2015). Artificial Intelligence and Soft Computing. $1^{st}$edition. New Delhi: CRC Press.

**WEBSITES**

1. www.amazon.in/soft+computing
2. www.soft-computing.de/def.html
3. en.wikipedia.org/wiki/Soft_computing
4. endnote.com/downloads/style/applied-soft-computing
5. www.allbookez.com/soft-computing-lecture-notes/
6. https://nptel.ac.in/courses/106105173/

**JOURNAL**

1. Seok-BeomRoh, Sung-Kwun Oh, Witold Pedrycz, KisungSeo, Zunwei Fu, Design methodology for Radial Basis Function Neural Networks classifier based on locally linear reconstruction and Conditional Fuzzy C-Means clustering, International Journal of Approximate Reasoning ,Pages 228-243,March 2019,

**22CSP111     PYTHON PROGRAMMING – PRACTICAL**      **4H – 2C**

**Instruction Hours / week:L: 0 T: 0 P: 4**     **Marks:** Internal:**40** External:**60** Total: **100**

                                           **End Semester Exam :** 3 Hours

**Course Objectives**
- To Master the principles of object-oriented programming and the interplay of algorithms and data structures in well-written modular code;
- To Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language;
- To Understand the basic logic statements in Python
- To Handle Strings in Python.
- To Understand Lists, Dictionaries in Python.
- To Build GUI applications

**Course Outcomes(COs)**
1. Master an understanding of scripting and the contributions of scripting languages.
2. Master an understanding of Python especially the object oriented concepts
3. Master an understanding of the built in objects of Python
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python Programs.
6. Be exposed to advanced applications such as TCP/IP network programming, multithreaded programming, Web applications.

**List of Programs**
1. Write a python program using Control statements
2. Write a python program using Functions and String Operations
3. Write a python program using List, Tuples and List comprehensions
4. Write a python program using Inheritance
5. Write a python program using Synchronization
6. Write a python program using Text Files
7. Write a python program using Graphical user Interfaces
8. Write a python program using Exceptional Handling
9. Write a python program using Classes and Objects
10. Write a python program using Chat Applications

**SUGGESTED READINGS**

1. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy. (2018).Deep Learning with TensorFlow: Explore neural networks with Python. Packt Publisher.

2. Antonio Gulli, Sujit Pal .(2017).Deep Learning with Keras. Packt Publishers.

3. Francois Chollet.(2017). Deep Learning with Python, Manning Publications.

4. Ethem Alpaydin.(2016). Introduction to Machine Learning, 3$^{rd}$ Edition. MIT Press, Prentice Hall of India.

5. Kevin P. Murphy. (2015). Machine Learning: A Probabilistic Perspective, The MIT Press.

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2. https://www.mathworks.com/discovery/deep-learning.html
3. https://machinelearningmastery.com/what-is-deep-learning/
4. https://www.ibm.com/cloud/learn/deep-learning

**22CSP112**       **BIG DATA ANALYTICS – PRACTICAL**       **4H – 2C**

**Instruction Hours / week:L: 0 T: 0 P: 4**     **Marks:** Internal:**40** External:**60** Total: **100**

                                      **End Semester Exam :** 3 Hours

**Course Objectives**

- To provide grounding in basic and advanced methods to big data technology and tools like MapReduce and Hadoop and its ecosystem.
- To understand the Big Data Platform and web analytics
- To provide an overview of Apache Hadoop and Design of HDFS
- To understand Map Reduce features
- To provide hands on Hbase, Pig and HiveQL queries
- To provide introduction to NoSQL and Data Model
- To give exposure to Graph databases Neo4J, Connecting your data and Dashboard

**Course Outcomes(COs)**

On successful completion of the course the student should be able to:

1. Apply Hadoop ecosystem components.
2. Access and Process Data on Hbase, Pig and HiveQL queries
3. Manage Job Execution in Hadoop Environment
4. Analyze Map Reduce Types
5. Apply Data Model and Connect your data and Dashboard
6. Participate data science and big data analytics projects

1. Implement the following file management tasks in Hadoop: Adding files and directories•
   Retrieving files• Deleting files•
   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
2. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
3. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
4. Implement Matrix Multiplication with Hadoop Map Reduce
5. Write a Map Reduce program to implement Join operations on RDBMS.
6. Write a Map Reduce program to determine statistical measures a) Variance b) Max c) Min d) Range of a large data collection.
7. K-means clustering using map reduce
8. Page Rank Computation

**SUGGESTED READINGS**

1. Daniel G.Murray. (2018). Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software. 2nd Edition. Wiley.
2. Joshua N. Milligan. (2016). Learning Tableau. Packt Publishing Ltd. UK
3. Tom White. (2015).The Definitive Guide to Mongodb. 4th Edition. OReilly.
4. Rik Van Bruggen. (2015). Learning Neo4j. 1st Edition. Packt Publishing Ltd. UK.
5. GauravVaish. (2015). Getting Started with NoSQL. Packt Publishing Ltd. UK.

6. Pramod J. Sadalage, Martin Fowler. (2015). NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Pearson Education.
7. Tom White. (2015). Hadoop: The Definitive Guide. 2<sup>nd</sup> Edition. OReilly.
8. Dirk deRoos, Paul Zikopoulos, Bruce Brown, Roman B. Melnyk,RafaelCoss. (2015). Hadoop For Dummies.

**WEB SITES**
1. https://www.tutorialspoint.com/big_data_analytics/
2. hadoop.apache.org/
3. https://www.mongodb.com/nosql-explained
4. https://neo4j.com/
5. https://nptel.ac.in/courses/106104189/

| | **Semester-II** |
|---|---|
| **22CSP201**        **INTERNETWORKING WITH TCP/IP** | **4H – 4C** |

**Instruction Hours / week:L: 4 T: 0 P: 0**    **Marks:** Internal:**40** External:**60** Total: **100**

                                                 **End Semester Exam :** 3 Hours

## Course Objectives

- To understand about subnets using IP classes
- To understand the key features and functions of TCP
- To understand how basic routing works including the use of routing protocols.
- To understand about DNS and its applications
- To understand the concepts of Remote Login and VPN
- To compare and contrast IP routing protocols

## Course Outcomes(COs)

At the completion of the course, students will:

1. Have the ability to analyze and differentiate networking protocols used in TCP/IP protocol suite.
2. Understand IP Addressing Fundamentals
3. Understand IPv4 forwarding and routing.
4. Learn about host name resolution and the Domain Name System (DNS).
5. Learn about services and operations of DHCP Servers and Domain Name Servers
6. Create major applications using the key TCP/IP protocols

## Unit I – INTRODUCTION

Introduction — Protocols and Standards – OSI layers- TCP/IP layers- Comparison between OSI and TCP/IP – Internetworking Devices – Routers-Bridges- Switches-Hubs – Classful Addressing –Classless Addressing – Subnetting –Supernetting

## Unit II - ARP & RARP

Proxy ARP – ARP over ATM – ARP and RARP Protocol Format. IP Datagram – Fragmentation – Options – IP Datagram Format – Routing IP Datagrams – Checksum. ICMP – Types of Messages - Message Format – Error Reporting – Query – Checksum.

## Unit III - ROUTING PROTOCOL

Unicast Routing Protocol: Intra Domain and Inter Domain Routing – Distance Vector Routing – RIP – Link State Routing – OSPF – Path Vector Routing – BGP – Multicast Routing – Multicast Routing Protocols. Group Management – IGMP Message – IGMP Operation – Process to Process Communication – UDP Operation – TCP Services  - Flow Control.

### Unit IV – BOOTP, DHCP

Host Configuration –Introduction – DHCP Operation – Configruation – DNS-Need for DNS - Name Space – DNS in Internet – Resolution – DNS Messages –Types of Record-Compression – Encapsulation-Registrars-DDNS- Security of DNS.

### Unit V - REMOTE LOGIN

Telnet-Concepts - Time-Sharing Environment -Network Virtual Terminal (NVT) -Embedding – Options- Symmetry - Suboption Negotiation - Controlling the Server - Out-of-Band Signaling - Escape Character -Modes of Operation - User Interface - Security Issue–Secure Shell –FTP – User Agent -SMTP –POP-IMAP- SNMP – Components-SMI-MIB-UDP Ports –Voice over IP.

### SUGGESTED READINGS

1. Jason Edelman, Scott Lowe  (2018), Network Programmability and Automation, O'Reilly
2. Jeff Doyle, Jennifer DeHaven Carroll (2012), Routing TCP/IP, Volume 1 (2nd Edition), Cisco Press
3. Behrouz, A. Forouzan. (2018). TCP/IP Protocol Suite. 3rd edition. Tata McGraw Hill Publication. New Delhi:
4. Andrews, S. Tanenbaum. (2017).Computer Networks. 4th edition.:Prentice Hall of India Private Ltd. New Delhi.
5. Buck Graham. (2017). TCP/IP Addressing. 2nd edition. Harcount India Private Limited. New Delhi
6. Douglas, E. Comer. (2016). Computer Networks and Internets. 4th edition. Pearson Education. New Delhi.
7. William Stallings. (2016). Data and Communication Network. 8th edition. Tata McGraw Hill. New Delhi

### WEBSITES

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp
5. https://nptel.ac.in/courses/106105081/

### JOURNALS

1. KoppisettiGiridhar, C. Anbuananth, N. Krishnaraj. **Research on Various Routing Techniques in Wireless Ad-hoc Networks**, International Journal of Recent Technology and Engineering (IJRTE), Volume-8, Issue-1S4, June 2019

## Course Objectives

- To state the basic concepts in information security, including security policies, security models, and security mechanisms.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To understand principles of web security.
- To gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
- To understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
- To provide the learner will be able to examine secure software development practices.

## Course Outcomes (COs)

A student who successfully completes this course should at a minimum be able to:

1. State the basic concepts in information security, including security policies, security models, and security mechanisms.
2. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
3. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
4. The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
5. The learner will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.
6. The learner will be able to examine secure software development practices.

## Unit I - INTRODUCTION TO CYBERCRIME

Definition and Information Security-who are cybercriminals? - Classification of cybercrimes. Cybercrime: The legal perspectives- cybercrimes: An Indian Perspective - cybercrime and the Indian ITA2000: Hacking and the Indian law(s) - A Global Perspective on cybercrimes: cybercrime and the Extended Enterprise - cybercrime Era: Survival Mantra for the Netizens - Concluding Remarks and Way Forward to Further Chapters.

## Unit II - CYBER OFFENSES

How Criminals Plan Them: Introduction: categories of Cybercrime -How criminals Plan the Attacks: Reconnaissance Passive Attacks Active Attacks Scanning and Scrutinizing Gathered Information Attack(Gaining and Maintaining the system Access) -social Engineering: Classification of Social Engineering – Cyber talking: Types of stalkers Cases Reported on Cyber stalking How stalking Works? real-life incident of Cyber stalking -Cybercafe and Cybercrimes - Botnets: The Fuel for cybercrime: Botnet - Attack Vector-Cloud Computing: Why cloud computing? Types of Services Cybercrime and Cloud Computing.

### Unit III – CYBERCRIME

Mobile and wireless Devices-Introduction - Proliferation of Mobile and Wireless Devices - Trends in Mobility-Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques of Credit Card Frauds - Security challenges Posed by Mobile Devices - Registry Settings for Mobile Devices - Authentication Service security: cryptographic security LDAP Security RAS Security Media Player Control Security Networking API Security - Attacks on Mobile/Cell Phones: Mobile Phone Theft Mobile Viruses Mishing Vishing Smishing Hacking Bluetooth.

### Unit IV - MOBILE DEVICES

Security Implication for Organizations – Managing Diversity and Proliferation of Hand-Held Devices Unconventional/ Stealth Storage Devices Threats through Lost and Stolen Devices Protecting Data on lost devices Educating the Laptop Users - Organizational Measures for Handling Mobile devices - Related Security Issues: Encrypting Organization Databases Including Mobile Devices in Security Strategy -Organizational Security Policies and Measures in mobile Computing Era: Importance of Security polices relating to mobile Computing Devices Operating Guidelines for Implementing Mobile Devices Security Polices Organizational Policies for the Use of Mobile Hand - Held Devices - Laptops: Physical Security Countermeasures.

### Unit V -TOOLS AND METHODS USED IN CYBERCRIME

Introduction - Proxy Servers and Anonymizers - Phishing: How Phishing Works? - Password Cracking: Online Attacks Offline Attacks Strong Weak and Random Passwords Random passwords - Keyloggers and Spywares: Software Keyloggers Hardware Keyloggers Anti Keylogger Spywares - Virus and Worms: Types of Virus - Trojan Horses and Backdoors: backdoor How to protect from Trojan Horses and Backdoors - Steganography: Steganalysis - DoS and DDoS Attacks: DoS AttacksClassification of DoS Attacks Types or Levels of DoS Attacks Tools Used to Launch DoS Attacks DDoS Attacks How to Protect from DoS/DDoS Attacks – SQL Injection: Steps for SQL Injection Attacks How to Prevent SQL Injection Attacks - Buffer Overflow: Types of Buffer Overflow How to Minimize Buffer Overflow - Attacks on Wireless Networks: Traditional Techniques of Attacks on Wireless Networks Theft of Internet Hours and Wi-fi-based Frauds and Misuses How to Secure the Wireless Networks.

### SUGGESTED READINGS

1. Nina Godbole & SUNIT Belapure. (2013). CYBER SECURITY. Wiley India Pvt. Ltd. New Delhi
2. Godbole, N. (2009). Information Systems Security: Metrics Frameworks and Best Practices. Wiley India. New Delhi
3. Marther, T., Kumaraswamy, S.,& Latif, S. (2009). Cloud Security and Privacy: An Enterprise Perceptive on Risk and Complaince. O'Reilly.
4. Dieter Gollmann . (2006). Computer Security. 2nd edition. John Wiley & Sons
5. Charles ,P. Pfleeger ,& Shari, L. Pfleeger. (2003).

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2. csrc.nist.gov/publications/nistpubs/800-12/handbook.pdf
3. www2.warwick.ac.uk/fac/sci/dcs/teaching/modules/cs134/
4. http://nptel.ac.in/courses/106105031/40
5. http://nptel.ac.in/courses/106105031/39
6. http://nptel.ac.in/courses/106105031/38

**JOURNALS**

1. Noura Al-Suwaidi , Haitham Nobanee , & Fauzia Jabeen, **Estimating Causes of Cyber Crime: Evidence from Panel Data FGLS Estimator,** International Journal of Cyber Criminology Vol 12 Issue 2 July – December 2018.

**Semester-II**

| 22CSP203 | **MONGODB** | **4H – 4C** |

**Instruction Hours / week:L: 4 T: 0 P: 0    Marks:** Internal:**40** External:**60** Total: **100**

**End Semester Exam :** 3 Hours

## Course Objectives

- To provide students the knowledge and skills to master the NoSQL database mongoDB.
- To Write MongoDB programs from JavaScript shell.
- To define, compare and use of MongoDB with other RDBMS
- To explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB
- To perform query optimization in MongoDB
- To understand replication and sharding in MongoDB

## Course Outcomes(COs)

1. To provide students the right skills and knowledge needed to develop Applications on mongoDB
2. To provide students the right skills and knowledge needed to run Applications on mongoDB
3. Writing MongoDB programs from JavaScript shell.
4. Explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB
5. Perform query optimization in MongoDB
6. Understand replication and sharding in MongoDB

## Unit I - GETTING STARTED

A database for the modern web – MongoDB through the JavaScript shell – Writing programs using MongoDB- MongoDB Document Model

## Unit II - APPLICATION DEVELOPMENT

Document-oriented data – Principles of schema design – Designing an e-commerce data model – Nuts and bolts on databases, collections, and documents. Queries and aggregation – E-commerce queries – MongoDB's query language – Data Types in MongoDB -Aggregating orders – Aggregation in detail.

## Unit III - UPDATES, ATOMIC OPERATIONS, AND DELETES

A brief tour of document updates – E-commerce updates – Atomic document processing – MongoDB updates and deletes. Indexing and query optimization: Indexing theory – Indexing in practice.

## Unit IV – REPLICATION

Overview – Replica sets – Master-slave replication – Drivers and replication. Shading: Overview – A sample shard cluster – Querying and indexing a shard cluster – Choosing a shard key.

## Unit V - DEPLOYMENT AND ADMINISTRATION

Deployment – Monitoring and diagnostics – Maintenance – Performance troubleshooting

**SUGGESTED READINGS**

1. Shakuntala Gupta Edward. (2018). Practical Mongo DB , 2nd edition, Apress Publications,  ISBN 1484206487
2. Rick Copeland. (2017). MongoDB Applied Design Patterns, 1st Edition, O"Reilly Media Inc.
3. Mike Wilson.. (2017). Building Node Applications with MongoDB and Backbone, O"Reilly Media Inc.
4. Kyle Banker. (2016). MongoDB in Action. Manning Publications Co.
5. Gautam Rege, (2016). Ruby and MongoDB Web Development Beginner's Guide. Packt Publishing Ltd
6. David Hows.  (2016). The definitive guide to MongoDB, 2nd edition, Apress Publication, 8132230485

**WEBSITES**

1. http://www.mongodb.org/about/production-deployments/
2. http://docs.mongodb.org/ecosystem/drivers/
3. http://www.mongodb.org/about/applications/
4. http://www.mongodb.org/
5. https://nptel.ac.in/courses/106106156/

**JOURNALS**

1. Swetha Siriah, Bhushan Deshpande, Deepak Asudani,"**MongoDB with Privacy Access Control "**, International Journal of Research and Review, Vol.5; Issue: 6; June 2018

**Semester-II**

**22CSP204**              **INTERNET OF THINGS**              **4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0     Marks:** Internal:**40** External:**60** Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**

- To Understand the Introduction to IoT and Architectural Overview of IoT
- To Understand the various IoT Protocols ( Datalink, Network, Transport, Session, Service)
- To understand the standardization of IoT
- To Understand the communication technologies in IoT  Know the IoT protocols and web of things
- To integrate IoT with billing and networks
- To  Know the various applications of IoT

**Course Outcomes(COs)**

A student who successfully completes this course should at a minimum be able to:

1. Understand building blocks of Internet of Things and characteristics.
2. Understand IoT protocols, Web of Things and Integrating IOT.
3. Understand the application areas of IOT ·
4. Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
5. Learn about communication technologies used in IoT
6. Learn about Web of Things, Structural models and applications of IoT.

**Unit I – INTRODUCTION**

Internet Layers - Protocols - Packets - Services - Performance parameters - Peer-to-peer networks - Sensor networks - Multimedia - IOT Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

**Unit II –IoT PROTOCOLS**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – point-to-point protocols - Ethernet protocols - cellular Internet access protocol - Machine-to-machine protocol - Modbus – KNX – Zigbee Architecture.

**Unit III - WEB of THINGS**

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence -Connectivity Technologies. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – The Cloud of Things Architecture.

**Unit IV - INTEGRATING IoT**
Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon.

**Unit V – APPLICATIONS**
The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging - Case studies: Sensor body-area-network and Control of a smart home.

**SUGGESTED READINGS**
1. Honbo Zhou . (2018). The Internet of Things in the Cloud:A Middleware Perspective-–CRC Press .
2. Olivier Hersent, Omar Elloumi and David Boswarthick . (2017). The Internet of Things: Applications to the Smart Grid and Building Automation . Wiley.
3. Olivier Hersent, David Boswarthick, Omar Elloumi. (2017). The Internet of Things – Key applications and Protocols.  Wiley.
4. Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.).(2016). Architecting the Internet of Things– Springer.
5. David Easley and Jon Kleinberg . (2016). Networks, Crowds, and Markets: Reasoning About a Highly Connected World , Cambridge University Press.


**WEBSITES**
1. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot
2. https://www.i-scoop.eu/internet-of-things-guide
3. https://iot-analytics.com
4. https://nptel.ac.in/courses/106105166/

**JOURNALS**
1. Mardiana binti , Mohamad NoorWan,  HaslinaHassan,” **Current research on Internet of Things (IoT) security: A survey**”, Computer Networks,Volume 148, 15 January 2019, Pages 283-294

**22CSP205A**          **ARTIFICIAL INTELLIGENCE**          **4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0      Marks:** Internal:**40**  External:**60** Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**
- To gain a historical perspective of AI and its foundations.
- To become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- To investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- To experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
- To experiment with a machine learning model for simulation and analysis.
- To explore the current scope, potential, limitations, and implications of intelligent systems.

**Course Outcomes (COs)**
1. Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
2. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
3. Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
5. Demonstrate proficiency in applying scientific method to models of machine learning.
6. Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

**Unit I - PROBLEM SOLVING AND AI**
Puzzles and Games – Problem States and operators – Heuristic programming – state space representations – state descriptions – graph notations – non- deterministic programs

**Unit II - STATE SPACE SEARCH METHODS**
Breadth first and depth first search –forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms – admissibility – optimality of algorithms – performance measures – problem reduction representations – AND/OR graphs and higher level state space

**Unit III - PROBLEM REDUCTION SEARCH METHODS**
Cost of solution trees – ordered search – alpha beta and minimum procedure – theorem proving in predicate calculus – syntax, semantics, Herbrand universe: variables, qualifiers, unification, resolvents

### Unit IV - PREDICATE CALCULUS IN PROBLEM SOLVING
Answer extraction process – resolution – Automatic program writing – predicate calculus – proof finding methods

### Unit V - EXPERT SYSTEMS
Expert systems and conventional programs – expert system organization – Knowledge engineering: knowledge representation techniques – knowledge acquisition – acquiring knowledge from experts – automating knowledge acquisition –Building an expert system – difficulties in developing an expert system

### SUGGESTED READINGS
1. Flasiński, Mariusz. (2018). Introduction to Artificial Intelligence. Tata Mcgraw Hill, Delhi.
2. Chandra .S.S.V. (2017). Artificial Intelligence and Machine Learning. Kindle Edition.
3. Dr.R.P.Das. (2017). Neural Networks and Fuzzy Logic. 1$^{st}$ Edition, Tata Mcgraw Hill, Delhi
4. Elain Rich and Kevin Knight. (1991). Artificial Intelligence.  McGraw Hill.
5. Donald A Waterman. (2016). A Guide to Expert Systems, Tech knowledge series in knowledge engineering.

### WEB SITES
1. https://www.tutorialspoint.com › Artificial Intelligence
2. www-formal.stanford.edu/jmc/whatisai/node3.html
3. https://nptel.ac.in/courses/106105079/

### JOURNALS
1. TimMiller, **Explanation in artificial intelligence: Insights from the social sciences**, Artificial IntelligenceVolume 267, February 2019, Pages 1-38

                                                                    **Semester-II**

**22CSP205B**            **MACHINE LEARNING**                         **4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0**     **Marks:** Internal:**40** External:**60** Total: **100**

                                               **End Semester Exam :** 3 Hours

**Course Objectives**
- To introduce students to the basic concepts and techniques of Machine Learning.
- To become familiar with regression methods, classification methods, clustering methods.
- To become familiar with Dimensionality reduction Techniques.
- To identify the characteristics of datasets and compare the trivial data and big data for various applications.
- To solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
- To effectively use machine learning toolboxes.

**Course Outcomes(COs)**
1. Gain knowledge about basic concepts of Machine Learning
2. Identify machine learning techniques suitable for a given problem
3. Apply Dimensionality reduction techniques.
4. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
5. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
6. Effectively use machine learning toolboxes.

**Unit I - FOUNDATIONS OF LEARNING**
Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound –bias and variance – learning curve

**Unit II - LINEAR MODELS**
Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptron – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – generalization and over fitting – regularization – validation

**Unit III - DISTANCE-BASED MODELS**
Nearest neighbor models – K-means – clustering around medoids – silhouttes –  hierarchical clustering – k- d trees – locality sensitive hashing  – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta silhouttes –  hierarchical clustering – k-

d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

### Unit IV - TREE AND RULE MODELS
Decision trees – learning decision trees – ranking and probability estimation trees –Regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first -order rule learning

### Unit V - REINFORCEMENT LEARNING
Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal - difference learning – active reinforcement learning – exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

### SUGGESTED READINGS
1. Y. S. Abu - Mostafa, M. Magdon-Ismail, and H.-T. Lin. (2017).Learning from Data, AMLBook Publishers.
2. P. Flach. (2016). "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press.
3. K. P. Murphy. (2016). Machine Learning: A probabilistic perspective, MIT Press.
4. D. Barber. (2016). Bayesian Reasoning and Machine Learning, Cambridge University Press
5. C. M. Bishop. (2016). Pattern Recognition and Machine Learning. Springer.

### WEBSITES
1. https://machinelearningmastery.com/linear-regression-for-machine-learning/
2. https://www.cambridge.org/core/books/machine-learning/distancebased-models/
3. https://dzone.com/articles/machine-learning-with-decision-trees
4. http://reinforcementlearning.ai-depot.com/
5. https://nptel.ac.in/courses/106105152/

### JOURNALS
1. Zachary C. Lipton, Jacob Steinhardt, **Research for Practice: Troubling Trends in Machine-Learning Scholarship,** Communications of the ACM, June 2019, Vol. 62 No. 6, Pages 45-53

**22CSP205C**                         **DEEP LEARNING**                    **4H – 4C**
**Instruction Hours / week: L: 4 T: 0 P: 0      Marks:** Internal:**40**  External:**60** Total: **100**
                                                                  **End Semester Exam :** 3 Hours

**Course Objectives**
- To understand the fundamentals of neural networks
- To learn about the working principles of back propagation networks
- To learn about introduction and different architectures of neural network
- To understand the selection of various Parameters in BPN.
- To explore the ideas of Adaptive Resonance Theory.
- To discuss the concept of fuzzy logic systems.

**Course Outcomes(COs)**
A student who successfully completes this course should at a minimum be able to:
1. Have adequate knowledge about basic Concepts of Neural Networks.
2. Understand the concept of fuzziness involved in various systems.
3. Understand comprehensive knowledge of fuzzy sets, Crisp sets, Fuzzy relations and Crisp relations.
4. Learn the concepts of Fuzzy Rule Based System and Defuzzification Methods.
5. Learn about the working principles of back propagation networks
6. Explore the ideas of Adaptive Resonance Theory

**Unit I-INTRODUCTION TO NEURAL NETWORKS**
Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

**Unit II-ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS**
Types of Neuron Activation Function,ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics(Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement),Learning Rules, Types of Application

**UnitIII-SINGLE LAYER FEED FORWARD NEURAL NETWORKS**
Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, TrainingAlgorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem,Limitations of the Perceptron Model, Applications.

**Unit IV-MULTILAYER FEED FORWARD NEURAL NETWORKS**
Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP)Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties
and Improvements.

**Unit V-CLASSICAL & FUZZY SETS**

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership,Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.Fuzzy Logic System Components- Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

**SUGGESTED READINGS**

1. Boris.ASkorohod, (2017), Diffuse Algorithms for Neural and Neuro-Fuzzy Networks, Pearson Education.
2. Flasiński, Mariusz. (2016). Introduction to Artificial Intelligence. Tata Mcgraw Hill, Delhi.
3. Rajasekharan and Rai (2016), Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
4. Dr.R.P.Das. (2016). Neural Networks and Fuzzy Logic. 1st Edition, Tata Mcgraw Hill, Delhi
5. James A. Freeman, David M. Skapura, (2016). Neural Networks – Algorithms, Applications and Programming Techniques, Pearson Education.
6. Simon Haykin. (2016).Neural Networks – A Comprehensive Foundation , Prentice Hall of India.

**WEB SITES**

1. http://neuralnetworksanddeeplearning.com/chap1.html
2. https://www.tutorialspoint.com/fuzzy_logic/fuzziness_in_neural_networks.htm
3. https://www.philadelphia.edu.jo/academics/kaubaidy/uploads/Syria-FN-2002.pdf
4. https://www.cse.unr.edu/~looney/cs773b/FNNtutorial.pdf
5. https://nptel.ac.in/courses/127105006/

**JOURNALS**

1. Simone A. Ludwig, **Applying a Neural Network Ensemble to Intrusion Detection** Journal of Artificial Intelligence and Soft Computing Research, Volume 9, Issue 3 (2019), pp. 177–188

**Semester-II**

| | | |
|---|---|---|
| **22CSP211** | **ROUTER CONFIGURATION – PRACTICAL** | **4H – 2C** |

**Instruction Hours / week:L: 0 T: 0 P: 4**     **Marks:** Internal:**40** External:**60** Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**
- To understand about subnets using IP classes
- To understand the key features and functions of TCP
- To understand how basic routing works including the use of routing protocols.
- To understand about DNS and its applications
- To understand the concepts of Remote Login and VPN
- To compare and contrast IP routing protocols

**Course Outcomes (COs)**

At the completion of the course, students will:
1. Have the ability to analyze and differentiate networking protocols used in TCP/IP protocol suite.
2. Understand IP Addressing Fundamentals
3. Understand IPv4 forwarding and routing.
4. Learn about host name resolution and the Domain Name System (DNS).
5. Learn about services and operations of DHCP Servers and Domain Name Servers
6. Create major applications using the key TCP/IP protocols

**List of Programs**
1. Simple router configuration.
2. Access and utilize the router to set basic parameters.
3. Connect configure and verify operation status of a device interface.
4. Implement static and dynamic addressing services for hosts in a LAN environment.
5. Identify and correct common problems associated with IP addressing and host configurations.
6. Configure verify and troubleshoot RIPv2.
7. Perform and verify routing configuration tasks for a static or default route given.
8. Configure verify and troubleshoot NAT operation on a router.
9. Configure and verify a PPP connection between routers.

**Suggested Readings**
1. Jason Edelman, Scott Lowe (2018), Network Programmability and Automation, O'Reilly
2. Jeff Doyle, Jennifer DeHaven Carroll (2012), Routing TCP/IP, Volume 1 (2nd Edition), Cisco Press
3. Behrouz, A. Forouzan. (2018). TCP/IP Protocol Suite. 3rd edition. Tata McGraw Hill Publication. New Delhi:
4. Andrews, S. Tanenbaum. (2017).Computer Networks. 4thedition.:Prentice Hall of India Private Ltd. New Delhi.
5. Buck Graham. (2017). TCP/IP Addressing. 2nd edition. Harcount India Private Limited. New Delhi

6. Douglas, E. Comer. (2016). Computer Networks and Internets. 4$^{th}$ edition. Pearson Education. New Delhi.

7. William Stallings. (2016). Data and Communication Network. 8$^{th}$ edition. Tata McGraw Hill. New Delhi

**WEBSITES**
1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp
5. https://nptel.ac.in/courses/106105081/

**Course Objectives**
- To Write MongoDB programs from JavaScript shell.
- To define, compare and use of MongoDB with other RDBMS
- To explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB
- To perform query optimization in MongoDB
- To understand replication and sharding in MongoDB

**Course Outcomes(COs)**
1. To provide students the right skills and knowledge needed to develop Applications on mongoDB
2. To provide students the right skills and knowledge needed to run Applications on mongoDB
3. Writing MongoDB programs from JavaScript shell.
4. Explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB
5. Perform query optimization in MongoDB
6. Understand replication and sharding in MongoDB

### List of Programs

Structure of 'restaurants' collection :
{ "address": { "building": "1007", "coord": [ -73.856077, 40.848447 ], "street": "Morris Park Ave", "zipcode": "10462" }, "borough": "Bronx", "cuisine": "Bakery", "grades": [ { "date": { "$date": 1393804800000 }, "grade": "A", "score": 2 }, { "date": { "$date": 1378857600000 }, "grade": "A", "score": 6 }, { "date": { "$date": 1358985600000 }, "grade": "A", "score": 10 }, { "date": { "$date": 1322006400000 }, "grade": "A", "score": 9 }, { "date": { "$date": 1299715200000 }, "grade": "B", "score": 14 }, "name": "Morris Park Bake Shop", "restaurant_id": "30075445" }

1. Write a MongoDB query
    a.  to display all the documents in the collection restaurants.
    b.  to display the fields restaurant_id, name, borough and cuisine for all the documents in the collection restaurant.
    c.  to display the fields restaurant_id, name, borough and cuisine, but exclude the field _id for all the documents in the collection restaurant
    d.  to display the fields restaurant_id, name, borough and zip code, but exclude the field _id for all the documents in the collection restaurant.
    e.  to display all the restaurant which is in the borough Bronx
    f.  to display the first 5 restaurant which is in the borough Bronx.
    g.  to display the next 5 restaurants after skipping first 5 which are in the borough Bronx.

h.   to find the restaurants who achieved a score more than 90.
i.   to find the restaurants that achieved a score, more than 80 but less than 100.
2. Write a MongoDB query
   a.   to find the restaurants which locate in latitude value less than -95.754168.
   b.   to find the restaurants that do not prepare any cuisine of 'American' and their grade score more than 70 and latitude less than -65.754168.
   c.   to find the restaurants which do not prepare any cuisine of 'American' and achieved a score more than 70 and not located in the longitude less than - 65.754168. Note : Do this query without using $and operator. Go to the editor
   d.   to find the restaurants which do not prepare any cuisine of 'American ' and achieved a grade point 'A' not belongs to the borough Brooklyn. The document must be displayed according to the cuisine in descending order.
3. Write a MongoDB query
   a.   to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Wil' as first three letters for its name. Go to the editor
   b.   to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'ces' as last three letters for its name.
   c.   to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Reg' as three letters somewhere in its name.
4. Write a MongoDB query
   a.   to find the restaurants which belong to the borough Bronx and prepared either American or Chinese dish.
   b.   to find the restaurant Id, name, borough and cuisine for those restaurants which belong to the borough Staten Island or Queens or Bronxor Brooklyn.
   c.   to find the restaurant Id, name, borough and cuisine for those restaurants which are not belonging to the borough Staten Island or Queens or Bronxor Brooklyn.
   d.   to find the restaurant Id, name, borough and cuisine for those restaurants which achieved a score which is not more than 10.
   e.   to find the restaurant Id, name, borough and cuisine for those restaurants which prepared dish except 'American' and 'Chinees' or restaurant's name begins with letter 'Wil'.
   f.   to find the restaurant Id, name, and grades for those restaurants which achieved a grade of "A" and scored 11 on an ISODate "2014-08- 11T00:00:00Z" among many of survey dates
   g.   to find the restaurant Id, name and grades for those restaurants where the 2nd element of grades array contains a grade of "A" and score 9 on an ISODate "2014-08-11T00:00:00Z".
5. Write a MongoDB query to find the restaurant Id, name, address and geographical location for those restaurants where 2nd element of coord array contains a value which is more than 42 and upto 52
6. Write a MongoDB query
   a.   to arrange the name of the restaurants in descending along with all the columns.
   b.   to arranged the name of the cuisine in ascending order and for that same cuisine borough should be in descending order.
7. Write a MongoDB query to know whether all the addresses contains the street or not.

8. Write a MongoDB query which will select all documents in the restaurants collection where the coord field value is Double.
9. Write a MongoDB query which will select the restaurant Id, name and grades for those restaurants which returns 0 as a remainder after dividing the score by 7.
10. Write a MongoDB query to find the restaurant name, borough, longitude and attitude and cuisine for those restaurants which contains 'mon' as three letters somewhere in its name.

## SUGGESTED READINGS

1.                          Shakuntala Gupta Edward. (2018). Practical Mongo DB , 2nd edition, Apress Publications,  ISBN 1484206487
2. Rick Copeland. (2017). MongoDB Applied Design Patterns, 1st Edition, O‟Reilly Media Inc.
3. Mike Wilson.. (2017). Building Node Applications with MongoDB and Backbone, O‟Reilly Media Inc.
4. Kyle Banker. (2016). MongoDB in Action. Manning Publications Co.
5. Gautam Rege, (2016). Ruby and MongoDB Web Development Beginner's Guide. Packt Publishing Ltd
6. David Hows.  (2016). The definitive guide to MongoDB, 2nd edition, Apress Publication, 8132230485

## WEBSITES
1. http://www.mongodb.org/about/production-deployments/
2. http://docs.mongodb.org/ecosystem/drivers/
3. http://www.mongodb.org/about/applications/
4. http://www.mongodb.org/
5. https://nptel.ac.in/courses/106106156/

|  |  | **Semester-III** |
|---|---|---|
| **22CSP301** | **J2EE** | **4H – 4C** |

**Instruction Hours / week:L: 4 T: 0 P: 0**    **Marks:** Int : **40** Ext : **60**     Total: **100**

                                                **End Semester Exam :** 3 Hours

**Course Objectives**

- To Understand the In-depth concepts of JEE
- To Understand the in-depth Life cycle of servlets and JSP.
- To Learn how to communicate with databases using Java.
- To Handle Errors and Exceptions in Web Applications
- To Use NetBeans IDE for creating J2EE Applications
- To impart expertise in Web Application Development using J2EE.

**Course Outcomes(COs)**

1. Understand the In-depth concepts of JEE
2. Understand the in-depth Life cycle of servlets and JSP.
3. Learn how to communicate with databases using Java.
4. Handle Errors and Exceptions in Web Applications
5. Use NetBeans IDE for creating J2EE Applications
6. Understand J2EE as an architecture and platform for building and deploying web-based, n-tier, transactional, component-based enterprise applications

**UnitI- J2EE OVERVIEW**

Beginning of Java – Java Byte code – Advantages of Java –J2EE and J2SE. J2EE Multi Tier Architecture – Distributive Systems – The Tier – Multi Tier Architecture – Client Tier Web Tier Enterprise Java Beans Tier Enterprise Information Systems Tier Implementation.

**UnitII - J2EE DATABASE CONCEPTS**

Data – Database – Database Schema. Introduction- Jdbc Architecture- Types of Drivers. Statement- ResultSet- Read Only ResultSet    -Updatable ResultSet--Forward Only ResultSet - Scrollable ResultSet - PreparedStatement—Metadata- Connection Modes-SavePoint- Batch Updations-CallableStatement- BLOB & CLOB.

**UnitIII - JAVA SERVLETS**

Benefits – Anatomy – HTML Forms- HTTP: Request-response, headers, GET, POST
-Servlet Lifecycle: init(), service(), destroy()- Requests and responses- Core Servlet API: GenericServlet, ServletRequest, and ServletResponse-HTTP Servlets: HttpServletRequest, HttpServletResponse and HttpServlet- Accessing Parameters

**UnitIV - ENTERPRISE JAVA BEANS**

Entity Java Bean - Session Java Bean – Home and Remote Interfaces-Stateless bean- Stateful bean- EJB Exceptions- EJB deployment process Message Driven Bean.

**Unit V – JSP**

Introduction-. Advantages of JSP over Servlet-JSP Architecture- JSP Lifecycle -Integration of JSP & Servlet API-JSP implicit objects-Use of JSP Tags, Actions and Directives- JSP Scripting

Elements: declaratives-scriptlets-expressions-JSP Actions: Standard Actions-Custom Actions-JSTL & Tag Library-Error Handling in JSP-Using Java Beans in JSP-Defining Custom Tags

**SUGGESTED READINGS**
1. Jim Keogh. (2018). The Complete Reference J2EE 1st edtion New Delhi: Tata McGraw Hill.
2. Duane, K. Fields., & Mark, A. Kolb. (2017). Web Development with Java Server Pages (1st ed.). Pune: Manning Publications.
3. Rod Johnson. (2017). J2EE Development without EJB 1st edition. New Delhi:Wiley Dream Tech.
4. Rod Johnson., & Rod Johnson, P.H. (2016). Expert One-On-One J2EE Design and Development. New Delhi: John Wiley & Sons.
5. Paul, J. Perrone., Venkata, S. R. Chaganti., Venkata S. R. Krishna., & Tom Schwenk. (2016). J2EE Developer's Handbook. New Delhi: Sams Publications.
6. Joseph, J. Bambara et al. (2016). J2EE Unleashed (1st ed.). New Delhi:Tech Media.


**WEBSITES**
1. https://www.oracle.com/technetwork/java/javaee/appmodel-135059.html
2. https://www.geeksforgeeks.org/introduction-java-servlets/
3. http://media.datadirect.com/download/docs/jdbc/alljdbc/jdbcconnect/j2ee.html
4. https://www.javatpoint.com/ejb-tutorial
5. https://www.javatpoint.com/jsp-tutorial
6. https://nptel.ac.in/courses/106105191/

**Semester-III**

**22CSP302        SOFTWARE TESTING AND QUALITY ASSURANCE        4H – 4C**

**Instruction Hours / week:L: 4 T: 0 P: 0       Marks:** Int : **40** Ext : **60**       Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**
- To understand the basics of testing, test planning &design and test team organization
- To study the various types of test in the life cycle of the software product.
- To build design concepts for system testing and execution
- To learn the software quality assurance ,metrics, defect prevention techniques
- To learn the techniques for quality assurance and applying for applications.
- To apply the software testing techniques in real-time applications

**Course Outcomes(COs)**
Upon completion of this course, the students should be able to:
1. Perform functional and nonfunctional tests in the life cycle of the software product.
2. Understand system testing and test execution process.
3. Create test cases for software testing techniques.
4. Identify defect prevention techniques and software quality assurance metrics.
5. Apply techniques of quality assurance for typical applications.
6. Identify the Root Cause analysis with quality assurance techniques.

**Unit I - SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES**
Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, . Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group ,System Test Team Hierarchy, Team Building.

**Unit II - SYSTEM TESTING**
System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

**Unit III - SYSTEM TEST CATEGORIES**
System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests.
Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote. system test design- Test Design Factors Requirement Identification, modeling a Test

Design Process Test Design Preparedness, Metrics, Test Case Design Effectiveness. system test execution- Modeling Defects, Metrics for Monitoring Test Execution .Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

### Unit IV - SOFTWARE QUALITY
Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model- Estimation Techniques.

### Unit V- SOFTWARE QUALITY ASSURANCE
Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

### SUGGESTED READINGS
1. Stephan Goericke.(2019). The Future of Software Quality Assurance, Stephan Goericke, Springer International Publishing.
2. Sandeep Desai, Abhishek Srivastava. (2018). Software Testing: A Practical Approach.PHI, New Delhi.
3. KshirasagarNakPriyadarshi Tripathy. (2017). Software Testing and Quality Assurance-Theory and Practice, John Wiley & Sons Inc.
4. Milind Limaye.(2016). Software Quality Assurance, , TMH ,New Delhi.
5. Jeff Tian. (2016). Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, , John Wiley & Sons, Inc., Hoboken, New Jersey..
6. Daniel Galin. (2016). Software Quality Assurance - From Theory to Implementation, Pearson Education Ltd UK.

### WEBSITES
1. https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm
2. https://www.altexsoft.com/whitepapers/quality-assurance-quality-control-and-testing-the-basics-of-software-quality-management/
3. http://softwaretestingfundamentals.com/software-quality-assurance/
4. https://www.softwaretestinghelp.com/software-quality-assurance/
5. https://nptel.ac.in/courses/106105150/
6. http://ijiet.com/wp-content/uploads/2016/04/15.pdf
7. https://www.springer.com/journal/11219

**22CSP303**                          **DIGITAL IMAGE PROCESSING**                    **4H – 4C**
**Instruction Hours / week:L: 4 T: 0 P: 0      Marks:** Int : **40** Ext : **60**          Total: **100**
                                                                    **End Semester Exam :** 3 Hours

**Course Objectives**
- To make the students learn the fundamental theories and techniques of digital image processing.
- To study the mathematical transforms necessary for image processing, image manipulation and a preliminary understanding of Computer Vision.
- To make students to understand the image degradation and enhancement.
- To understand the basic relationships between pixels in an image
- To know various segmentation techniques, and object descriptors.
- To implement pattern recognition to enhance an image.

**Course Outcomes(COs)**
1. Perform image manipulations and analysis in many different fields.
2. Apply knowledge of computing mathematics science and engineering to solve problems in multidisciplinary research.
3. Implement the understanding in sharpening the image.
4. Perform the image segmentation using the compression method.
5. Understand the image to represent in an region.
6. Analyze the basic algorithms used for image processing &image compression with morphological image processing.

**Unit I**– **INTRODUCTION**
Digital image processing – Origins of digital image processing- Examples of fields that use digital image processing-Fundamental steps in digital image processing- Components of an image processing system-Representing digital image.

**Unit II- BASIC RELATIONSHIPS BETWEEN PIXELS**
Basic gray level transformations- Histogram processing - Basic spatial filtering- Smoothing special filtering- Image Degradation/ Restoration process- Noise Models.

**Unit III - IMAGE SEGMENTATION**
Thresholding - Edge Based Segmentation Edge Operators; Line Detection, Corner Detection – Region Based Segmentation Region Growing Based Segmentation, Region Splitting, Region Merging, Split and Merge – Matching. Image Compression: Error Criterion - Lossy Compression - Lossless Compression.

**Unit IV -SHAPE REPRESENTATION AND DESCRIPTION**
Region Identification - Contour Based Representation And Description – Region Based Shape Representation And Description.

**Unit V- IMAGE RECOGNITION**

Introduction – Statistical Pattern Recognition - Neural Net- Syntactic Pattern Recognition - Graph Matching – Clustering-Texture Image Analysis-Image Data Compression

**SUGGESTED READINGS**

1. Rafael, C. Gonzalez., & Richard, E. Woods. (2018). Digital Image Processing (3$^{rd}$ ed.). New Delhi:Pearson Education.
2. Milan Sonka., Vaclav Hlavac.,& Roger Boyle. (2017). Image Processing Analysis and Machine Vision (2$^{nd}$ ed.). New Delhi: Vikas Publishing House.
3. Chanda, B., & Dutta Majumder, D. (2016). Digital Image Processing and Analysis (1$^{st}$ ed.). New Delhi: Prentice Hall of India.
4. Nick Efford. (2016). Digital Image Processing – A Practical introduction using JAVA (1$^{st}$ ed.). New Delhi: Pearson Education Limited.

**WEB SITES**
1. http://www.cs.dartmouth.edu/farid/tutorials/fip.pdf
2. http://www.imageprocessingbasics.com/
3. http://www.astropix.com/HTML/J_DIGIT/TOC_DIG.HTM
4. https://nptel.ac.in/courses/117105079/
5. https://nptel.ac.in/courses/117105135/

**JOURNALS**
1. https://link.springer.com/journal/10278
2. https://sites.google.com/site/ijcsis/digital-image-processing
3. http://www.ciitresearch.org/dl/index.php/dip
4. https://ieeexplore.ieee.org/document/4336327

**22CSP304**                    **GREEN COMPUTING**

**Instruction Hours / week:L: 4 T: 0 P: 0**        **Marks:** Int : **40** Ext : **60**        Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**

- To provide a comprehensive coverage of topics related to green computing.
- To provide an insight into Fundamentals of Green IT, Green Assets and Modeling
- To understand IT use in relation to environmental perspectives.
- To discuss Green Compliance and Green Mobile
- To relate green IT to sustainable development
- To provide deep understanding about Green Computing by discussing Case studies.

**Course Outcomes(COs)**

1. Give an account of the concept green IT,
2. Give an account of Green Assets and Modeling,
3. Describe green IT in grid framework in relation to technology,
4. Relate green IT to sustainable development,
5. Evaluate IT use in relation to environmental perspectives,
6. Analyze case studies based on green IT

**Unit I - FUNDAMENTALS OF GREEN IT**

Business, IT, and the Environment – Green computing– Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics - Approaches to green computing - Middleware Support - Compiler Optimization - Product longevity – Software induced energy consumption - its measurement and rating.

**Unit II - GREEN ASSETS AND MODELING**

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence.

**Unit III - GRID FRAMEWORK**

Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

**Unit IV - GREEN COMPLIANCE AND GREEN MOBILE**

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future - Green mobile - optimizing for minimizing battery consumption - Web, Temporal and Spatial Data Mining Materials recycling.

**Unit V - CASE STUDIES**

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

**SUGGESTED READINGS**

1. Wu Chun Feng. (2018). "Green computing: Large Scale energy efficiency". CRC Press.
2. BhuvanUnhelkar. (2017). Green IT Strategies and Applications-Using Environmental Intelligence. CRC Press.
3. Alin Gales, Michael Schaefer, Mike Ebbers. (2017). Green Data enter: steps for the Journey. Shoff/IBM rebook
4. Woody Leonhard, Katherrine Murray. (2017). Green Home computing for dummies.
5. John Lamb. (2016). "The Greening of IT". Pearson Education.
6. Jason Harris. (2016). "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com.

**WEB SITES**

1. https://www.researchgate.net/post/What_is_Green_Computing
2. https://www.kbmanage.com/concept/green-computing
3. https://www.computer.org/csdl/proceedings/hicss/2010/3869/00/02-03-06.pdf

**JOURNALS**

https://www.researchgate.net/publication/229175907_Green_IT_Case_studies

**22CSP305A            WEB ENGINEERING**                            **4H – 3C**
**Instruction Hours / week:L: 4 T: 0 P: 0      Marks:** Int : **40** Ext : **60**Total: **100**
                                                      **End Semester Exam :** 3 Hours

## Course Objectives
- To understand the concepts, principles, strategies, and methodologies of web applications development.
- To Understand the characteristics of web applications
- To Learn to Model web applications
- To be aware of Systematic methods
- To be  familiar with the testing techniques for web applications
- To design and develop a web application

## Course Outcomes(COs)
1. Apply the characteristics of web applications.
2. Model web applications.
3. Learn to create requirement engineering for web applications
4. Understand the various architecture of web applications
5.  Design web applications.
6. Test  and develop web applications.

## Unit I -INTRODUCTION
Motivation – categories & characteristics of web applications – product related, usage related and development related – evolution of WE.

## Unit II - REQUIREMENTS ENGINEERING (RE) FOR WEB APPLICATIONS
Introduction – fundamentals –sources of requirements – RE activities – RE specifications in WE - RE principles for web applications – adapting RE methods for web applications development – requirement types, notations, tools.

## Unit III - WEB APPLICATION ARCHITECTURE
Introduction – fundamentals – definition of architecture – developing and characterizing architectures – components of a generic web application architecture – layered architecture – database centric architecture - architecture for web document management – architecture for multimedia data.

## Unit IV -MODELING WEB APPLICATIONS
Introduction – modeling specifics in WE – levels – aspects – phases of customizations – modeling requirements – hypertext modeling - hypertext structure modeling concepts – access modeling concepts. Web application design – web design from an evolutionary perspective – information design – software design – merging information design & software design– interaction design – user interaction – user interface organization.

## Unit V - TESTING WEB APPLICATIONS

Introduction – fundamentals – terminology – quality characteristics – test objectives – test levels – role of tester – test specifics in web – test approaches – conventional, agile - test schemes applying the scheme to web applications – test methods and techniques – link testing – browser testing – usability testing – load, stress and continues testing

### SUGGESTED READINGS

1. Chrits Bates. (2018). Web Programming: Building Internet Applications, 3ʳᵈ Edition,Wiley India Edition, ISBN: 8126512903
2. Gerti Kappel, Birgit Proll, Siegried Reich and Werner Retschitzegger. (2017). Web Engineering: The Discipline of Systematic Development of Web Applications, John Wiley and Sons Ltd, ISBN: 9780470064894.
3. Guy W Leeky-Thompson. (2017). Just Enough Web Programming with XHTML, PHP, and MySQL. 1ˢᵗ Edition, Cenagage Learning, ISBN: 159863481X.
4. Leon Shklar and Rich Rosen. (2017). Web Application Architecture: Principles, Protocols and Practices. 2ⁿᵈ Edition. Wiley, ISBN: 047051860X.
5. Roger S Pressman and David Lowe. (2016). Web Engineering: A Practitioner's Approach. 1 st Edition. Tata Macgraw Hill Publications, ISBN: 9780073523293.
6. Anders Moller and Michael Schwartzbach. (2016). An Introduction to XML and Web Technologies. 1ˢᵗ Edition. Pearson Education, New Delhi.

### WEB SITES

1. http://www.csun.edu/~twang/595WEB/Slides/Week1.pdf
2. https://www.quora.com/What-is-web-engineering
3. https://www.scribd.com/document/324899044/Web-Engineering-Models
4. https://nptel.ac.in/courses/106106156/

**22CSP305B          WIRELESS APPLICATION PROTOCOL          4H – 3C**

**Instruction Hours / week:L: 4 T: 0 P: 0      Marks:** Int : **40** Ext : **60**      Total: **100**

**End Semester Exam :** 3 Hours

## Course Objectives

- To learn the concept of Wireless Application Protocols.
- To learn Development tools, Language and built Wireless Application
- To learn wireless concepts, Technologies and gateways.
- To know the components of WAP.
- To learn the different application area of WAP.
- To understand the environment of WAP.
- To understand components and various protocols.
- To know about WTA Architecture and its security

## Course Outcomes (COs)

1. Pursue research in the area of wireless communication.
2. Develop applications that are mobile-device specific and demonstrate current practice in mobile communication contexts.
3. Understand Components of the WAP Standards and Wireless Telephony Applications
4. Understand components and various protocols.
5. Know about WTA Architecture and its security
6. Design and Develop a wireless application using WML

## Unit I - MOBILE DATA INTRODUCTION

The Rise of Mobile Data-Key Services for the Mobile Internet- Overview of the WAP-The origins of the WAP- WAP architecture-WAP Internal Structure-Components of the WAP Standards- WAP Gateways-Network Infrastructure Services Supporting WAP Clients-WAP Architecture Design Principles –Relationship with other standards.

## Unit II - THE WIRELESS MARKUP LANGUAGE

Overview-The WML Document Model-WML Authoring-URLS Identity Content-Mark Up Basics- WML Basics-Basic Content-Events Tasks and Binding.

## Unit III - VARIABLES

Other Content you can include-Controls-Miscellaneous Markup- Sending Information-Application Security-Other Data**;** The Meta element- Document Type Declarations- Errors and browsers Limitations-Content generation- WML Version Negotiation.

## Unit IV - USER INTERFACE DESIGN

Making Wireless Applications Easy to Use- Website Design- Computer Terminals Vs Mobile Terminals-Designing a usable WAP site-structured usability method-user interface design guidelines- Design guidelines for selected WML Elements.
Database-Driven WAP: ASP and WAP, ActiveX Data Objects (ADO), methods of converting existing HTML web site to WAP, M-Commerce and Security, Push Technology and Telematics.

**Unit V - WIRELESS TELEPHONY APPLICATIONS**

Overview of the WTA Architecture- WTA Client Frame Work –WTA Server and Security-Design Considerations- Application Creation Tool Box- Future of WTA Enhancements.
The Mobile Internet Future**:** Better Content- Easier Access-Beyond Browsing – Beyond Cellular-Mobile Data Unleashed.

**SUGGESTED READINGS**
1. Ruseyev, S. (2018). WAP Technology & Applications. 1st edition. New Delhi: Eswar Publications.
2. Charles Arehart., & Nirmal Chidambarametal. (2017). Professional WAP.New Delhi: Shroff Publishers & Distributers Pvt Ltd.
3. Dale BulBrook. (2016). WAP –A Beginner's Guide. 1st edition. New Delhi:  TMH Publication
4. Sandeep Singhal. (2016). The Wireless Application Protocol. 1st edition. New Delhi:  Pearson Education.

**WEB SITES**
1. www.en.wikipedia.org/wiki/Wireless_Application_Protocol
2. www.wap.com
3. www.w3schools.com/wap/
4. https://www.tutorialspoint.com/wap/wap_introduction.htm

**JOURNAL**
1. http://journal.library.iisc.ernet.in/index.php/iisc/article/view/511
2. http://www.ijecs.in/index.php/ijecs/article/view/2819
3. http://www.ijtrd.com/papers/IJTRD1289.pdf

**Semester-III**

| 22CSP305C | **SOFTWARE PROJECT MANAGEMENT** | 4H – 3C |

**Instruction Hours / week:L: 4 T: 0 P: 0** **Marks:** Int : **40** Ext : **60** Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**
- To deliver students skills for planning, implementing a software project
- To develop and deliver a software
- To make the student to understand the techniques for the project
- To analyze and solve the risks in the project.
- To understand the monitoring and tracking of the project.
- To express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment

**Course Outcomes (COs)**
1. Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
2. Implement software.
3. Analyze, specify and document software requirements for a software system.
4. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.
5. Implement and understand the estimation of the project.
6. Apply the concepts of project management & planning

**Unit I– INTRODUCTION**
Software Project Management -Project evaluation and programme Management- An overview of Project planning- Stepwise Planning-Selection of an appropriate project Approach.

**Unit II-SOFTWARE EFFORT ESTIMATION**
Problems with over- and underestimates-Software effort estimation Techniques - Estimating by analogy -Albrecht function point analysis -Function points Mark II –COSMIC full function points - COCOMO 13: a parametric productivity model. Activity planning: The objectives of activity Planning-Project schedules - Projects and activities - Sequencing and scheduling activities - Network planning models - Formulating a network model - Adding the time dimension - The forward pass - The backward pass - Identifying the critical path.

**Unit III- RISK MANAGEMENT**
Introduction to Risk - Categories of risk - A framework for dealing with risk -Risk identification - Risk assessment - Risk planning - Risk management - Evaluating risks to the schedule - Applying the PERT technique - Monte Carlo simulation - Critical chain concepts. Resource allocation: - Introduction -The nature of resources - Identifying resource requirements -Scheduling resources - Creating critical paths -Counting the cost - Being specific -Publishing the resource schedule - Cost schedules -The scheduling sequence.

### Unit IV - MONITORING AND CONTROL
Creating the framework-Collecting the data- Visualizing progress- Cost monitoring -Earned value analysis-Prioritizing monitoring - Getting the project back to target - Change control. Managing people in software environments: Understanding behavior -Organization behavior: a background - Selecting the right person for the job - Instruction in the best methods - Motivation - Stress -Health and safety -Some ethical and professional concern

### Unit V- WORKING IN TEAMS
Becoming a team - Decision making - Organizational structures - Coordination dependencies - Dispersed and virtual teams - Communication genres -Communication plans - Leadership. Software quality:  Introduction -The place of software quality in project planning - The importance of software quality - Defining software quality - ISO 9126 -Product versus process quality management -Quality management systems -Process capability models -Techniques to help enhance software quality -Testing -Quality plans

### SUGGESTED READINGS
1. Kelkar. (2018). "Software Project Management", 3$^{rd}$ edition, Prentice Hall India.
2. Royce.(2017). Software Project Management, 1$^{st}$ Edition, New  Delhi: Addisions Wesley.
3. Bob Hughes and Mike Cotterell. (2017). Software Project Management, 5$^{th}$ Edition, New Delhi: Tata McGraw Hill

### WEB SITES
1. http://en.wikipedia.org/wiki/Software_project_management
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. http://www.cc.gatech.edu/classes/AY2000/cs3802_fall/
4. https://nptel.ac.in/courses/106105218/
5. https://swayam.gov.in/nd1_noc19_cs70/preview

### JOURNAL
1. https://www.sciencedirect.com/science/article/pii/s2212017313002491
2. https://cyberleninka.org/article/n/685215.pdf

**22CSP311**                    **J2EE – PRACTICAL**            **3H – 2C**

**Instruction Hours / week:L: 0 T: 0 P: 3     Marks:** Int : **40** Ext : **60** Total: **100**

**End Semester Exam :** 3 Hours

**Course Objectives**
- To Understand the In-depth concepts of JEE
- To Understand the in-depth Life cycle of servlets and JSP.
- To Learn how to communicate with databases using Java.
- To Handle Errors and Exceptions in Web Applications
- To Use NetBeans IDE for creating J2EE Applications
- To impart expertise in Web Application Development using J2EE.

**Course Outcomes(COs)**
1. Understand the In-depth concepts of JEE
2. Understand the in-depth Life cycle of servlets and JSP.
3. Learn how to communicate with databases using Java.
4. Handle Errors and Exceptions in Web Applications
5. Use NetBeans IDE for creating J2EE Applications
6. Understand J2EE as an architecture and platform for building and deploying web-based, n-tier, transactional, component-based enterprise applications

**List of Programs**

1. Create a sign in form in servlets.
2. Write a servlet Program to lock a server.
3. Write a servlet program that returns list of information in table format.
4. Design a counter that counts number of times user has visited the site in current browsing session.
5. Write a program to retrieve cookies information
6. Build a JAVA Bean for opening an applet from JAR file.
7. Write a program to add controls in BEAN.
8. Design a counter in JAVA BEAN.
9. Write a program to stream contents of a file using JSP.
10. Write a program to insert an applet into JSP page.

**SUGGESTED READINGS**
1. Jim Keogh. (2018). The Complete Reference J2EE 1ˢᵗ edtion New Delhi: Tata McGraw Hill.
2. Duane, K. Fields., & Mark, A. Kolb. (2017). Web Development with Java Server Pages (1st ed.). Pune: Manning Publications.
3. Rod Johnson. (2017). J2EE Development without EJB 1ˢᵗ edition. New Delhi:Wiley Dream Tech.
4. Rod Johnson., & Rod Johnson, P.H. (2016). Expert One-On-One J2EE Design and Development. New Delhi: John Wiley & Sons.

5. Paul, J. Perrone., Venkata, S. R. Chaganti., Venkata S. R. Krishna., & Tom Schwenk. (2016). J2EE Developer's Handbook. New Delhi: Sams Publications.
6. Joseph, J. Bambara et al. (2016). J2EE Unleashed (1st ed.). New Delhi:Tech Media.

**WEBSITES**
1. https://www.oracle.com/technetwork/java/javaee/appmodel-135059.html
2. https://www.geeksforgeeks.org/introduction-java-servlets/
3. http://media.datadirect.com/download/docs/jdbc/alljdbc/jdbcconnect/j2ee.html
4. https://www.javatpoint.com/ejb-tutorial
5. https://www.javatpoint.com/jsp-tutorial
6. https://nptel.ac.in/courses/106105191/

**22CSP312      SOFTWARE TESTING AND QUALITY ASSURANCE PRACTICAL  3H – 2C**
**Instruction Hours / week:L: 0 T: 0 P: 3     Marks:**Int:**40**Ext:**60**  Total: **100**
                                                                 **End Semester Exam:**3 Hours

## Course Objectives
- To highlight the strategies for software testing and understand the concept of testing tools.
- To explain methods of capturing, specifying, visualizing and analysing software requirements.
- To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces with the help of testing tool.
- To know basics of testing and understanding concept of Testing Tools.
- To learn the criteria and design for test cases.
- To explore the usage of Selenium tool for software testing

## Course Outcomes (COs)
1. Work effectively as leader/tester of a development team to deliver quality software artifacts.
2. Implement a given software design using sound development practices.
3. Verify, validate, assess and assure the quality of software artifacts.
4. Design test cases suitable for a software development for different domains.
5. Identify suitable tests to be carried out.
6. Explore the usage of Selenium tool for software testing

## List of Programs
## Using Testing Tool: (Selenium)
1. Conduct a test suite for any two websites.
2. Program to Select Checkbox in Selenium Driver.
3. Program to Select radio Button in Selenium Driver.
4. Write a Program to Scroll a web page in Selenium WebDriver.
5. Write and test a program to login a specific webpage.
6. Create Locators in Selenium using IDE.
7. Find Element and Find Elements in Web using Selenium WebDriver.

## Suggested Readings
1. Stephan Goericke.(2019). The Future of Software Quality Assurance, Stephan Goericke, Springer International Publishing.
2. Sandeep Desai, Abhishek Srivastava. (2018). Software Testing: A Practical Approach.PHI, New Delhi.
3. KshirasagarNakPriyadarshi Tripathy. (2017). Software Testing and Quality Assurance-Theory and Practice, John Wiley & Sons Inc.
4. Milind Limaye.(2016). Software Quality Assurance, , TMH ,New Delhi.
5. Jeff Tian. (2016). Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, , John Wiley & Sons, Inc., Hoboken, New Jersey..
6. Daniel Galin. (2016). Software Quality Assurance - From Theory to Implementation, Pearson Education Ltd UK.

**WEBSITES**

1. https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm
2. https://www.altexsoft.com/whitepapers/quality-assurance-quality-control-and-testing-the-basics-of-software-quality-management/
3. http://softwaretestingfundamentals.com/software-quality-assurance/
4. https://www.softwaretestinghelp.com/software-quality-assurance/
5. https://nptel.ac.in/courses/106105150/
6. http://ijiet.com/wp-content/uploads/2016/04/15.pdf
7. https://www.springer.com/journal/11219

 

                                                          **Semester-III**

**22CSPOE301**             **Cyber Forensics**                                 **3H-2C**
**Instruction Hours / week:L: 3 T: 0 P:0**     **Marks:** Int: **40** Ext: 60       Total: 1**00**
                                                **End Semester Exam:** 3 Hours

### Course Objectives
- To understand about computer forensics and investigations.
- To know about digital evidence and crime.
- To analyze and validate forensics data.
- To know about e-mail investigation.
- To understand about Mobile device forensics.
- To understand the tools and tactics associated with Cyber Forensics.

### Course Outcomes (COs)
Upon completion of this course the students will be able to:

1. Define, understand and explain various investigation procedures and summarize duplication of digital evidence.
2. Apply the knowledge of digital evidences.
3. Design and develop various forensics tools and analyse the network forensics.
4. Demonstrate the systematic study of high-tech forensics
5. Understand the importance of reports.
6. Understand the tools and tactics associated with Cyber Forensics.

### Unit I- Computer forensics and investigations
Computer forensics and investigations as a profession – Preparing for computer investigations – Taking a systematic approach–Procedures for corporate high-tech investigations–Data recovery work stations and software– Conducting an investigation.

### Unit II-Data acquisition
Data acquisition – Storage formats for digital evidence – Validating data acquisitions – Processing crime and incident scenes–Identifying digital evidence–Collecting evidence in private sector incident scenes – Preparing for search-seizing digital evidence at the scene-storing digital evidence –Reviewing a case.

### Unit III - Computer Forensics Tools
Current computer forensics tools–Software tools–Hardware tools–The Macintosh file structure and boot process – Computer forensics analysis and validation – Addressing data –Hiding techniques.

### Unit IV-Network forensics
Virtual machines – Network forensics – Developing standard procedures – Live acquisitions – email investigations – Investigating e-mail crimes and violations – Understanding e-mail servers – Cell phone and mobile device forensics.

**Unit V- Mobile Device Forensics**

Understanding mobile device forensics – Acquisition procedures –Report writing for high-tech investigations – Importance of reports – Guidelines for writing reports –Expert testimony in high-tech investigations.

**Suggested Readings**
1. Bill Nelson, Amelia Phillips and Christopher Steuart. (2018). Computer Forensics and Investigations, Cengage Learning, 5th Edition.
2. Eoghan Casey.(2017). "Handbook of Digital Forensics and Investigation", Academic Press, 1st Edition,
3. John R Vacca,.(2016)."Computer Forensics", Cengage Learning, 2nd Edition.

**Websites**
1. www.cps.brockport.edu/~shen/cps301/figures/figure1.pdf
2. www.forensicsguru.com/devicedataextractionsimcell.php
3. www.nptel.ac.in/courses/106101060
4. www.samsclass.info/121/ppt/ch11.ppt
5. www.garykessler.net/library/role_of_computer_forensics.html
6. www.ukessays.com/essays/information-technology/computer-forensics-and-crime investigations-information-technology-essay.php

**Semester-III**

**22CSP391**                **INTERNSHIP**                **0H- 2C**

**Instruction Hours / week:L: 0 T: 0 P: 0     Marks:** Int: **100** Ext: 0         Total: 1**00**

**End Semester Exam:** 3 Hours

**Semester-IV**
**22CSP491**                    **PROJECT AND VIVA VOCE**                    **0H-15C**

**Instruction Hours / week:L: 0 T: 0 P: 0      Marks:** Int: **80** Ext: 120        Total: 2**00**
                                                              **End Semester Exam:** 3 Hours