ST. ALBERT'S COLLEGE (AUTONOMOUS),

ERNAKULAM

Affiliated to Mahatma Gandhi University, Kottayam, Kerala

SYLLABUS FOR POSTGRADUATE PROGRAMME

MASTERS IN COMPUTER SCIENCE

UNDER CREDIT SEMESTER SYSTEM

(WITH EFFECT FROM 2019 ADMISSION)

Syllabus of M.Sc. Computer Science

Proposed by the Board of Studies on 22th November 2017

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Chairperson, Board of Studies

Approved by the Academic Council on 16th August 2019

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Adopted by the Governing Council on 19th August 2019

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Acknowledgement

The Board of Studies places in record the help rendered to us by the scholars, parents and teachers in making this syllabus perfect. The Board wishes to thank the individual members who had worked tirelessly each day working on the enrichment of the curriculum. The board thanks the management of St. Albert's College (Autonomous) and Mahatma Gandhi University for giving us a chance to enrich the syllabus to suit the needs and necessities of the times.

We hope that syllabus will be challenging and easy for understanding at the undergraduate level. We sincerely hope those students who are to study this syllabus will be model citizens who couldlead the world to better heights of glory.

We wish all the learners and facilitators all the best for the effective transaction of this syllabus.

Board of Studies

Ernakulam

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Preface

As envisaged in the recent regulations of Autonomous colleges in India by University Grants Commission, autonomous colleges enjoy the academic freedom to enrich the curriculum by incorporating recent trends and needs. Curriculum and syllabus of each academic program has to be revised periodically to impart major objectives like global competency, skill component, values and regional relevance. Academicians and scholars in the respective area of knowledge have to express a missionary zeal for this great purpose.

In 2016, when St. Albert's College was granted autonomy, we adopted the curriculum and syllabus followed by the Mahatma Gandhi University, Kottayam for the year 2016. In 2019, when the Mahatma Gandhi University made a comprehensive revision of their curriculum and syllabus, it was adopted by the college as it was a better curriculum that met the needs and current demands of the culture, the society, and the expectations of the population being served. However, the Syllabus revision committee of the department studied the present curriculum in detail and proposed some reasonable changes for further enrichment which may be implemented from 2019 admission onwards.

The present M.Sc. postgraduate programme in Computer Science is a Choice Based Credit Semester System with four semesters, offering specialization and electives in the third and fourth semesters. It is intended that students will acquire due knowledge and skill which will enable them to get employed in technological research Institutes, and in related Industries/departments. Attempts were also made to integrate the essential components to generate interest for self-employment or start-ups among the pupils. All possible attempts have been made to update the syllabus by incorporating current and most recent developments in various branches of computer sciences.

Programme Outcomes

Critical Thinking: Students develops an informed and analytical approach to learning and demonstrate an in-depth knowledge of the subject.

Problem Solving: Students identify, formulate, analyse problems and reaching substantiated conclusions using principles of mathematics and applied sciences.

Computational Thinking: Students demonstrate competencies in computing and get domain knowledge suitable for translation of data into abstract concepts using computing technology-based tools.

Self-directed and Life-long Learning : Students develops a passion to be an independent lifelong learner by imbibing real-time changes in the socio-technological context, promoting continuous development and improvement of the knowledge and skills needed for employment and personal fulfilment.

Programme Specific Outcomes

1) Build technology-oriented students with the knowledge and ability to develop creative solutions.

2) Apply computer science theory and software development concepts to construct computing-based solutions.

3) Identify the need and scope of the Interdisciplinary research.

4) Capable of adapting to new technologies and constantly upgrade their skills with an attitude towards independent and lifelong learning.

Regulations

1. SHORT TITLE
   1.1. These regulations shall be called SACA Regulations (2020) governing Post Graduate Programmes under Credit Semester System (SACA-PG-CSS 2020).
   1.2. These Regulations shall come into force from the Academic Year 2020-2021 onwards.

2. SCOPE
   2.1. The regulations provided herein shall apply to all Regular Post-graduate programmes conducted in the Institution, with effect from the academic year 2020-2021.
   2.2. The provisions herein supersede all the existing regulations for the regular post-graduate programmes conducted in the Institution.

3. DEFINITIONS
   3.1. 'Academic Council' means the Committee constituted by the Governing body under this regulation to monitor the running of the post-graduate programmes under the Credit Semester System (SACA-PG-CSS 2020).
   3.2. 'Academic Week' is a unit of five working days in which distribution of work is organized from day one to day five, with five contact hours of one hour duration on each day. A sequence of minimum of 18 such academic weeks constitutes a semester.
   3.3. 'Audit Course' is a course for which no credits are awarded.
   3.4. 'CE' means Continuous Evaluation (Internal Evaluation)
   3.5. 'Comprehensive viva-voice' means the oral examinations conducted by the appointed examiners and shall cover all courses of study undergone by a student for the programme.
   3.6. 'Core Course' means a course which cannot be substituted by any other course.
   3.7. 'Course' means a course segment of subject matter to be covered in a semester. Each course is to be designed variously under lectures/ tutorials/ laboratory or fieldwork/ seminar/ project/ practical training/ assignments/ viva-voice etc., to meet effective teaching and learning needs.
   3.8. 'Course Code' means a unique alphanumeric code assigned to each course

of a programme.

3.9. 'Course Credit' on credit of a course is defined as a minimum of 1 hour lecture /minimum of two hours lab field work per week for 18 weeks in a Semester. The course will be considered as completed only by conducting the final examination.

3.10. 'Course Teacher' means the teacher of the institution in charge of the course offered in the programme.

3.11. 'Credit (Cr)' of a course is a numerical value which depicts the measure of the weekly unit of work assigned for that course in a semester

3.12. 'Credit point (CP)' of a course is the value obtained by multiplying the Grade Point (GP) by the credit (Cr) of the course CP = GP x Cr.

3.13. 'Cumulative Grade point average (CGPA)' is the value obtained by dividing the sum of credit points of all the courses taken by the students for the entire programme by the total number of credits and shall be rounded off to two decimal places. CGPA determines the overall performance of a student at the end of the programme. (CGPA = total CGPA obtained /Total credits of the programme)

3.14. 'Department' means any teaching Department in the Institution offering a programme of study approved as per the Act/ statutes of the University.

3.15. 'Department Council' means the body of all teachers of a Department in a college.

3.16. 'Dissertation' means a long document on a particular subject in connection with the project/ research/ field work etc.

3.17. 'Duration of a Programme' means the period of time required for the conduct of the programme. The duration of the post-graduate programme shall be 4 semesters spread over two academic years.

3.18. 'Elective course' means a course, which can be substituted, by an equivalent course from the same subject.

3.19. 'Elective Group' means a group consisting of elective courses for the programme.

3.20. 'ESE' means End Semester Evaluation (External Evaluation).

3.21. 'Evaluation 'is the process by which the knowledge acquired by the student is quantified as per the criteria detail in these regulations.

3.22. 'External Examiner 'is the teacher appointed from other colleges for the valuation of courses of study undergone by the students in a college.

The external examiner shall be appointed by the College.

3.23. 'Exam Coordinator 'is a teacher nominated by the Department Council to coordinate the continuous evaluation and other academic activities undertaken in the Department of the college.

3.24. 'Grace Grade Points' means grade points awarded to course(s), in recognition of the students' meritorious achievement in NSS/Sports/ Arts and cultural activities etc.

3.25. 'Grade point (GP) letter grade is assigned a 'Grade point' (GP) which is an integer indicating the numerical equivalent of the board level of performance of a student in a course.

3.26. 'Grade Point Average (GP)'is an index of the performance of student in a course. It is obtained by dividing the sum of the weighted grade points obtained in the course by the sum of the weights of the course. (GPA= ∑WGP/∑W).

3.27. 'Improvement course' is a course registered by a student for improving his/ her performance in that particular course.

3.28. 'Internal Examiner' is a teacher nominated by the department concerned to conduct internal evaluation.

3.29. 'Letter Grade' or 'Grade' for a course is a letter symbol (A^+, A, B^+, B, C, C^+, D) which indicates the broad level of performance of a student for a course.

3.30. 'SACA-PG-CSS 2020' means St. Albert's College Autonomous Regulations Governing Post Graduate Programmes under Credit Semester System, 2020.

3.31. 'Parent Department' means the Department which offers a particular post graduate programme.

3.32. 'Plagiarism' is the unreferenced use of other authors'' material in dissertations and assignments and is a serious academic offence.

3.33. 'Programme' means the entire course of study and examinations.

3.34. 'Project' is a core course in a programme. It means a regular project work with stated credits on which the student undergoes a project under the supervision of a teacher in the parent department/ any appropriate research center in order to submit a dissertation on the project work as specified. It allows students to work more autonomously to construct their own learning and culminate in a realistic, student-generated product for findings.

3.35. 'Repeat course' is a course that is repeated by the student for having failed in that course in an earlier registration.

3.36. 'Semester' means a team consisting of a minimum of 90 working days, inclusive of examinations, distributed over a minimum of 18 weeks of 5 working days each.

3.37. 'Seminar' means a lecture given by the student on a selected topic and is expected to train the student in self-study, collection of relevant matter from various resources, editing, document writing and presentation.

3.38. 'Semester Grade Point Average'(SGPA) is the value of trained by dividing the sum of credit points CP obtained by a student in the various courses taken in a semester by the total number of credits for the course in that semester. The SGPA shall be rounded off to two decimal places. SGPA determines the overall performance of a student at the end of the semester (SGPA= Total CP obtained in the semester /Total Credits for the semester).

3.39. 'Tutorial' means a class to provide an opportunity to interact with students at their individual level to identify the strength and weakness of individual students.

3.40. 'University' means Mahatma Gandhi University, Kottayam, Kerala.

3.41. 'College' means St. Albert's College (Autonomous), Ernakulam, Kerala.

3.42. 'Weight' is a numeric measure assigned to the assessment units of various components of a course of study.

3.43. 'Weighted Grade Point'(WGP) is the grade point multiplied by weight. (WPG = GP x W).

3.44. 'Weighted Grade Point Average (WGPA)' is an index of the performance of a student in a course. It is obtained by dividing the sum of the weighted grade points by the sum of the weights. WGPA shall be obtained for CE (Continuous Evaluation) and ESE (End Semester Evaluation) separately and then the combined WGPA shall be obtained for each course.

3.45. Words and expressions used and not defined in this regulation but defined in the Mahatma Gandhi University Act and Statutes that you shall have the meaning assigned to them in the Act and Statute.

4. ACADEMIC COUNCIL: COMPOSITON OF ACADEMIC COUNCIL
   1. The Principal (Chairman)
   2. All Heads of the Departments
   3. Four teachers of the college representing different categories of teaching staff by rotation on the basis of seniority of service in the college.
   4. Not less than four experts/academicians from outside the college representing areas such as Industry, Commerce, Law, Education, Medicine, Engineering, Sciences etc., to be nominated by the Governing Body.
   5. Three nominees of the university not less than Professors.
   6. A faculty member nominated by the Principal (Member Secretary).

5. PROGRAMME STRUCTURE

5.1. The medium of instruction shall be English.

5.2. Student shall be admitted to post graduate programmes under various faculties. The programme shall include three types of courses, Core courses, Elective courses and Common core courses. There shall be a project with the dissertation and comprehensive viva-voce as core courses for all programmes. The programme shall also include assignments/ seminars/practicals project field study etc.

5.3. Elective course and Groups

5.3.1. There shall be at least two and not more than four elective groups (Group A, Group B, Group C, etc.) comprising of three courses each for a programme and these elective courses shall be included either in the fourth semester or be distributed among third and fourth semesters. This clause is not applicable to MSW, MBA and M. Voc.

5.3.2. The number of elective courses assigned for study in a particular semester shall be the same across all elective groups for the programme concerned.

5.3.3. The colleges shall select any one of the elective groups for each programme as per the interest of the students, availability of faculty and academic infrastructure in the Institution.

5.3.4. The selection of courses from different elective groups is not permitted.

5.3.5. The elective group selected by the college shall be intimated to the Controller of Examinations without within two weeks of

commencement of the semester in which the elective courses are offered. The elective group selected by the college for the students who are admitted in a particular academic year shall not be changed.

5.4. Project work

5.4.1. Project work shall be completed in accordance with the guidelines given in the curriculum and shall be carried out under the supervision of a teacher of the department concerned. A candidate may, however, in certain cases be permitted to work on the project in an Industrial/ Research Organization on the recommendation of the supervising teacher.

5.4.2. There shall be internal assessment and external assessment for the project work.

5.4.3. The project work shall be evaluated based on the presentation of the project work done by the student, the dissertation submitted and the Viva-voce on the project.

5.4.4. The external evaluation of the project work shall be conducted by an external examiner from different college and an internal examiner from the college concerned.

5.4.5. The final Grade of the project (External) shall be calculated by taking the average of the Weighted Grade Points given by the two external examiners and the internal examiner.

5.5. Assignments: Every student should submit at least one assignment as an internal component for each course.

5.6. Seminar Lecture: Each student shall deliver one seminar lecture as an internal component for every course with a weightage of two. The seminar lecture is expected to train the student is self-study, collection of relevant matter from the various resources, editing, document writing, and presentation.

5.7. Test Papers (Internal): Student shall undergo at least two class tests as an internal component for each course with a weightage of one each. The best two shall be taken for awarding the grade for class tests.

5.8. No course shall have more than 5 credits unless otherwise specified.

5.9. Comprehensive Viva-Voce: Comprehensive Viva-voce conducted at the end of fourth semester of the programme and its evaluation shall be conducted by the examiners of the project evaluation.

5.9.1. Comprehensive Viva-Voce cover questions from all courses in the programme.

5.9.2. There shall be an internal assessment and an external assessment for the comprehensive Viva-voce.

6. ATTENDANCE

6.1. The minimum requirement of aggregate attendance during a semester for operating at the end-semester examination shall be 75%. Condonation of shortage of attendance for students having a minimum of 65% attendance, (up to a maximum of 10 days) in a semester subject to a maximum of two times during the whole Period of the programme may be granted by the College.

6.2. If a student represents his/her institution, University, State or Nation in Sports or Cultural or any other officially sponsored activities such as College Union/ University Union etc. he/ she shall be eligible to claim the attendance for the actual number of days participated subject to a maximum of 10 days in a semester based on the specific recommendations of the teacher concerned, class tutor, Head of the Department forwarded through the Dean Students Affairs subjected to the approval of the Principal. For exceptional achievements/situations, the Principal may recommend for the award of additional attendance to the Governing Body.

6.3. Those who could not register for the examination of a particular semester due to shortage of attendance will not be able to repeat the semester and will be removed from the rolls.

7. REGISTRATION/DURATION

7.1. A student shall be permitted to register for the programme at the time of admission.

7.2. A student who has registered for the programme shall complete the programme within a period of four years from the date of commencement of the programme.

8. ADMISSION

8.1. The admission to all regular PG programme shall be through the Centralised Allotment Process of the College.

8.2. If there is an entrance examination specified for the admission for a

particular programme, it will be as per the directions of the office of the CoE of the college.

8.3. The eligibility criteria for admission to PG programmes shall be published by the College in the prospectus.

9. ADMISSION REQUIREMENTS

9.1. Candidates for admission to the first semester of the PG programme through CSS shall be required to have passed an appropriate Degree Examination of any recognized university/institutions. Other eligibility requirements for specific programmes will be published in the prospectus.

9.2. Students admitted under this programme are governed by the Regulations of the College.

10. PROMOTION

10.1. A student who registers for a particular semester examination shall be promoted to the next semester.

11. EXAMINATIONS

11.1. There shall be an examination conducted by St. Albert's College, (Autonomous) at the end of each semester.

11.2. Practical Examination shall be conducted by the College at the end of semester or at the end of even semester as prescribed in the syllabus of the particular programme. The number of examiners for the Practical Examination shall be prescribed by the Board of Studies of the program.

11.3. End Semester Examinations: The examinations shall normally be conducted at the end of each semester.

11.4. There shall be one End-semester examination of 3 hours duration for each lecture based courses.

11.5. A question paper may contain short answer type/annotation, short essay type questions problem and long essay type questions. Different types of questions shall have different weightages.

12. EVALUATION AND GRADING

12.1. **Evaluation:** The evaluation scheme for each course shall contain two parts; (a) End Semester Evaluation (ESE) (External Evaluation) and (b) Continuous Evaluation (CE) (Internal Evaluation). The ratio of weightage

between internal and external is 1:3 (unless for the courses, it is otherwise specified by the BoS). Both End Semester Evaluation (ESE) and Continuous Evaluation (CE) shall be carried out using direct grading system.

12.2. Direct grading: The direct grading for CE (Internal) and ESE (External Evaluation) shall be based on 6 letter grades (A+, A, B, C, D and E) with numerical values of 5, 4, 3, 2, 1 and 0 respectively.

12.3. Grade Point Average GPA: internal and external components are separately graded and the combined grade point with weightage 1 for internal and 3 for external shall be applied to calculate the Grade Point Average (GPA) of each course. Letter grade shall be assigned to each course based on the categorization provided.

12.4. Internal evaluation for regular programme: The internal evaluation shall be based on a predetermined transparent system involving periodic written tests, assignments, seminars, lab skills, records, Viva-voce etc.

12.5. Components of internal (CE) and external evaluation (ESE): Grades shall be given to the evaluation of theory/ practical/ project/ comprehensive Viva-voce and all internal evaluations based on the Direct Grading System.

Proper guidelines shall be prepared by the BOS for evaluating the assignment, seminar, practical, project and the comprehensive viva-voce within the framework of the regulation.

12.6. There shall be no separate minimum grade point for internal evaluation.

12.7. The model of the components and its weightages of continuous evaluation (CE) and End Semester Evaluation (ESE) are Shown in below:

a) For theory (CE)(Internal)

	Components	Weightage
i.	Assignment	2
ii.	Seminar	4
iii.	Best Two Test papers	4 (2 each)
Total		10

(Grades of best two test papers shall be considered. For test papers all questions shall be set in such a way that the answers can be awarded A+, A, B, C, D, E grade.)

b) For the theory (ESE) (External)

Evaluation is based on the pattern of questions specified 12.16.5

c) For Practical (CE) (Internal)

Components	Weightage
Written/Lab test	2
Lab involvement and Record	1
Viva	2
Total	5

(The components and the weightage of the components of the practical (Internal) can be modified by the concerned BOS without changing the total weightage 5.)

d) For Practical (ESE) (External)

Components	Weightage
Written / Lab test	7
Lab involvement and Record	3
Viva	5
Total	15

[The components and the weightage of the practical (External) can be modified by the concerned BOS without changing the total weightage 15.]

e) For Project (CE) (Internal)

Components	Weightage
Relevance of the topic and analysis	2
Project content and presentation	2
Project viva	1
Total	5

(The Components and the weightage of the components of the project (Internal) can be modified by the concerned BOS without changing the total weightage 5.)

f) For Project (ESE) (External)

Components	Weightage
Relevance of the topic and analysis	3
Project content and presentation	7
Project viva	5
Total	15

(The Components and the weightage of the components of the project (External) can be modified by the concerned BOS without changing the total weightage 15.)

g) Comprehensive viva-voce (CE)(internal)

Components	Weightage
Comprehensive viva-voce (all courses from first semester to fourth semester)	5
Total	5

(Weightage of the components of the comprehensive viva-voce(internal) shall not be modified.)

h) Comprehensive viva-voce (CE)(External)

Components	Weightage
Comprehensive viva- voce (all courses from first semester to fourth semester)	15
Total	15

(Weightage of the components of the comprehensive viva-voce(external) shall not be modified unless specified by the respective BoS for a particular course.)

12.8. All grade point averages shall be rounded to two decimal points.

12.9. To ensure transparency of the evaluation process, the internal assessment grade awarded to the students in each course in a semester shall be published on the notice board at least one week before the commencement of the external examination.

12.10. There shall not be any chance for improvement for internal grade.

12.11. The course teacher and the Exam coordinator shall maintain the academic details of each student registered for the course and a copy should be kept in the department for verification for at least five years after the student completes the programme.

12.12. External evaluation: The external examination in theory courses is to be conducted by the College at the end of the semester. The answers should be in English expect those for the Faculty of Languages. The evaluation of the answer scripts shall be done by examiners based on a well-defined scheme of valuation. The external evaluation shall be done immediately after the examination.

12.13. Photocopies of the answer scripts of the external examination shall be made available to the students on request as per the rules prevailing in the College.

12.14. The question paper should be strictly on the basis of model question papers set and the directions prescribed by the BOS/Governing Body of the college for each programme.

12.15. Pattern of questions

12.15.1. Questions shall be set to access the knowledge acquired, standard application of Knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. Due weightages shall be given to each module based on content/ teaching hours allotted to each module.

12.15.2. The question setter shall ensure that questions covering all outcomes are met.

12.15.3. A question paper shall be a judicious mix of short answer type, short essay type/ problem solving type and long essay type questions.

12.15.4. The questions shall be prepared in such a way that the answers can be awarded A+, A, B, C, D, E grades.

12.15.5. Weight: Different types of questions shall be given different weights to quantify their range as follows:

Sl. No.	Type of Questions	Weight	Number of questions to be answered
1.	Short Answer type questions	1	8 out of 10
2	Short essay/ problem solving type questions	2	6 out of 8
3.	Long Essay type questions	5	2 out of 4

12.16. **Pattern of questions for practical**: the pattern of questions for external evaluation of practical shall be prescribed by the Board of Studies.

12.17. **Direct grading System**: Direct Grading System based on a 6-point scale is used to evaluate the Internal and External examinations taken by the students for various courses of study.

Grade	Grade Points
A+	5
A	4
B	3
C	2
D	1
E	0

12.18. **Performance Grading**

Students are graded based on their performance (GPA/SGPA/CGPA) at the examination on a 7-point scale as detailed below. *(7-point scale needed clarification)*

Range	Grade	Indicator
4.50 to 5.00	A+	Outstanding
4.00 to 4.49	A	Excellent
3.50 to 3.99	B+	Very good
3.00 to 3.49	B	Good (Average)
2.50 to 2.99	C+	Fair

2.00 to 2.49	C	Marginal(pass)
up to 1.99	D	Deficient (Fail)

12.19. No separate minimum is required for internal evaluation for a pass, but a minimum C grade is required for a pass in an external evaluation. However, a minimum C grade is required for pass in a course.

12.20. A student who fails to secure a minimum grade for a pass in a course will be permitted to write the examination along with the next batch.

12.21. Improvement of course: The candidates who wish to improve the grade/ grade point of the external examination of a course/ courses he/she has passed can do the same by appearing in the external examination of the semester concerned along with the immediate junior batch. This facility is restricted to first and second semesters of the program.

12.22. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) calculations. The SGPA is the ratio of the sum of the credit points of all courses taken by a student in the semester to the total credit for that semester. After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below.

Semester Grade Point Average –SGPA (S_j) = $\sum(C_i \times G_i) / \sum C_i$
(SGPA = Total credit Points awarded in all semesters / Total credits of the semester)

Where 'S_j' is the j^{th} semester, 'G_i' is the grade point scored by the student in the i^{th} course 'C_i' is the credit of i^{th} course.

12.23. Cumulative Grade Point Average (CGPA) of a programme is calculated using the formula:-

Cumulative Grade Point Average (CGPA) =$\sum(C_i x S_i) / \sum C_i$

(CGPA = Total credit Points awarded in a semester / Total credits of the programme)

Where 'C_i' is the credits for the i^{th} semester 'S_i' is the SGPA for the i^{th} semester.
The SGPA and CGPA shall be rounded off to 2 decimal points.
For the successful completion of semester, a student shall pass all courses and score a minimum SGPA of 2.0 . However, a student is permitted to move to the next semester irrespective of her/ his SGPA.

13. GRADE CARD

13.1. The College under its seal shall issue to the students, a consolidated grade card on completion of the programme, which shall contain the following information.

a) Name of College
b) Name of the University
c) Title of the PG Program
d) Name of the Semesters
e) Name and Register Number of the student
f) Code, Title, Credits and Max GPA (Internal, External & Total) of each course (theory & Practical), project, viva etc., in each semester.
g) Internal, external and total grade, Grade Point (G), Letter Grade and Credit point (P) in each course opted in the semester.
h) The total credits and total credit points in each semester
i) Semester Grade Point Average (SGPA) and corresponding Grade in each semester
j) Cumulative Grade Point Average (CGPA), Grade for the entire Program.
k) Separate Grade card will be issued at the request of candidates and based on College Guidelines issued from time to time.
l) Details of description of evaluation process-Grade and Grade Point as well as indicators, calculation methodology of SGPA and CGPA as well as conversion scale shall be shown on the reverse side of the grade card.

14. AWARD OF DEGREE

The successful completion of all the courses with 'C' grade within the stipulated period shall be the minimum requirement for the award of the degree.

15. MONITORING COMMITTEE

There shall be a Monitoring Committee constructed by the Principal to monitor the internal evaluation conducted by departments.

16. POSITION CERTIFICATE

The College shall publish the list of top 3 candidates for each programme after the publication of the programme results. Position certificate shall be issued to candidates on their request.

Candidates shall be ranked in the order of merit based on the CGPA secured by them. Grace grade points awarded to the students shall not be counted for fixing that rank/position. Position certificates shall be signed by the Controller of Examinations.

17. GRIEVANCE REDRESSAL COMMITTEE

In order to address the grievance of students a three-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

17.1. Class Level: The cell is chaired by the class tutor and the course teacher or a teacher nominated by the Head of the Department.

17.2. Department level: The College shall form a Grievance Redressal Committee in each department comprising of the course teacher and one senior teacher as members and the Head of the Department as Chairperson. The committee shall address all grievances relating to the internal assessment grade of the students.

17.3. College level: A committee with the Principal as Chairman, Dept. Coordinator, HOD of concerned Department and a senior teacher nominated by the Executive Committee as members.

18. TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Governing Body shall, for a period of two years from the date of coming into force of these regulations, have the power to provide by order that these regulations shall be applied to any programme with such modifications as may be necessary.

19. Credits allotted for program and Courses

19.1. Total credit for each program shall be 80.

19.2. Semester-wise total credit can vary from 16 to 25.

19.3. The minimum credit of a course is 2 and maximum credit is 8.

20. Course code: The course codes assigned for all courses (core courses,

elective courses, common courses etc.) shall be unique.

21. Models of distribution of courses, course codes, type of the course, credits, teaching hours for a program are given in the following table.

Example **Programs with the practical-Total Credits 80-** scheme of the syllabus

Semester	Course Code	Course name	Type of the course	Teaching Hours Per Week	Credit	Total Credits
I	Course.code1	Name1	Core	4	4	19
	Course.code 2	Name2	Core	4	4	
	Course.code 3	Name3	Core	4	4	
	Course.code 4	Name4	Core	3	3	
	Practical Course.code 5	Name5	Core	10	4	
II	Course.code 6	Name6	Core	4	4	20
	Course.code 7	Name7	Core	4	4	
	Course.code 8	Name8	Core	4	4	
	Course.code 9	Name9	Core	3	4	
	Practical- Course.code1 0	Name10	Core	10	4	
III	Course.code1 1	Name11	Core	4	4	20
	Course.code1 2	Name12	Core	4	4	
	Course.code1 3	Name13	Core	4	4	
	Course.code1 4	Name14	Core	3	4	

	Practical Course.code15	Name15	Core	10	4	
IV	Course.code16	Name16	Elective	5	3	21
	Course.code17	Name17	Elective	5	3	
	Course.code18	Name18	Elective	5	3	
	Practical-Course.code19	Name19	Core	10	5	
	Project-Course.code20	Name20	Core		5	
	Comprehensive viva-voce - Course.code21	Name 21	Core		2	
	Total					80

Example **Programmes without practical - Total credit 80** schemes of the syllabus

Semester	Course code	Course name	Type of the course	Teaching Hours per week	Credit	Total Credits
I	Course.code 1	Name 1	core	5	4	20
	Course.code 2	Name 2	core	5	4	
	Course.code 3	Name 3	core	5	4	
	Course.code 4	Name 4	core	5	4	

	Course.code 5	Name 5	core	5	4	
II	Course.code 6	Name 6	core	5	4	20
	Course.code 7	Name 7	core	5	4	
	Course.code 8	Name 8	core	5	4	
	Course.code 9	Name 9	core	5	4	
	Course.code 10	Name 10	core	5	4	
III	Course.code 11	Name 11	core	5	4	20
	Course.code 12	Name 12	core	5	4	
	Course.code 13	Name 13	core	5	4	
	Course.code 14	Name 14	core	5	4	
	Course.code 15	Name 15	core	5	4	
IV	Course.code 16	Name 16	Elective	5	3	20
	Course.code 17	Name 17	Elective	5	3	
	Course.code 18	Name 18	Elective	5	3	
	Course.code 19	Name 19	core	5	4	
	Project-Course.code 20	Name 20	core	5	5	
	Comprehensive viva-voce-Course.code 21	Name 21	core		2	

	Total					80

Appendix

1. Evaluation first stage-Both internal and external (to be done by the teacher)

Grade	Grade Points
A+	5
A	4
B	3
C	2
D	1
E	0

The final Grade range for courses SGPA and CGPA

Range	Grade	Indicator
4.50 to 5.00	A+	Outstanding
4.00 to 4.49	A	Excellent
3.50 to 3.99	B+	Very good
3.00 to 3.49	B	Good
2.50 to 2.99	C+	Fair
2.00 to 2.49	C	Marginal
Up to 1.99	D	Deficient (Fail)

Theory -External – ESE
Maximum weight for external evaluation is 30. Therefore, Maximum Weighted Grade Point (WGP) is 150

Type of Question	Qn. No's	Grade Awarded	Grade point	Weights	Weighted Grade Point
Short Answer	1	A+	5	1	5
	2	-	-	-	-
	3	A	4	1	4
	4	C	2	1	2
	5	A	4	1	4
	6	A	4	1	4
	7	B	3	1	3
	8	A	4	1	4
	9	B	3	1	3
	10	-	-	-	
Short Essay	11	B	3	2	6
	12	A+	5	2	10
	13	A	4	2	8
	14	A+	5	2	10
	15	-	-	-	-
	16	-	-	-	-
	17	A	4	2	8
	18	B	3	2	6
Long Essay	20	A+	5	5	25
	21	-	-	-	-
	22	-	-	-	-
	23	B	3	5	15
			TOTAL	30	117

Calculation:
Overall Grade of the theory paper = Sum of Weighted Grade Points /Total weight 117/30 = 3.90 = Grade B

Theory- Internal-CE

Maximum weight for internal evaluation is 5. Therefore, Maximum weight Grade Point (WGP) is 25.

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W *GP	Overall Grade of the course
Assignment	2	A	4	8	WGP/Total weight = 48/10 =4.8
Seminar	4	A+	5	20	
Test paper 1	2	A+	5	10	
Test paper 2	2	A+	5	10	
Total	10			48	A+

Practical-External-ESE

Maximum weight for external evaluation is 5. Therefore Maximum Weighted Grade Point (WPG) is 75.

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W*GP	Overall Grade of the course
Written/Lab	7	A	4	28	
Test					WGP/Total
Lab					weight
Involvement & Record	3	A+	5	15	= 58 / 15 = 3.86
Viva	5	B	3	15	
Total	15			58	B

Practical-Internal-CE

Maximum weight for internal evaluation is 5. Therefore, Maximum Weighted Grade Point (WGP) is 25

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W*GP	Overall Grade of the course
Written/ Lab test	2	A	4	8	WGP/Total weight =17/5=3.40
Lab involvement & record	1	A+	5	5	
Viva	2	C	2	4	
Total	5			17	B

Project-External-ESE

Maximum weight for external evaluation is 15. Therefore, Maximum weighted Grade Point (WGP) is 75.

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W*GP	Overall Grade of the course
Relevance of the topic & Analysis	2	C	2	4	WGP/Total weight = 59/15= 3.93
Project content & presentation	8	A+	5	40	
Project viva- voce	5	B	3	15	
Total	15			59	B

Project-Internal-CE

Maximum weight for Internal evaluation is 5. Therefore, Maximum Weighted Grade Point (WGP) is 25.

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W *GP	Overall Grade of the course
Relevance of the topic & Analysis	2	B	3	6	WGP/Total weight = 21/5 = 4.2
Project content & presentation	2	A+	5	10	
Project viva- voce	1	A+	5	5	
Total	5			21	A

Comprehensive viva-voce-External-ESE

Maximum weight for External evaluation is 15. Therefore, maximum Weighted Grade Point (WGP) 75.

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W*GP	Overall Grade of the course
Comprehensive viva-voce	15	A	4	60	WGP/Total weight = 60 / 15 = 4
Total	15			60	A

Comprehensive viva-Internal-CE

Maximum Weight for Internal evaluation is 5. Therefore, Maximum Weighted Grade Point (WGP) is 25.

Components	Weight (W)	Grade Awarded	Grade Point (GP)	WGP= W *GP	Overall Grade of the course
Comprehensive viva-voce	5	A+	5	25	WGP/Total weight = 25/ 5 = 5
Total	5			25	A+

Evaluation- Second stage (to be done by the College)

Consolidation of the Grade (GPA) of a Course PC-1

The End Semester Evaluation valuation (ESE) (External evaluation) grade awarded for the course PC -1 is A and its Continuous Evaluation (CE) (Internal Evaluation) grade is A. The consolidated grade for the course PC -1 is as follows:

Evaluation	Weight	Grade awarded	Grade Points awarded	Weighted Grade Point
External	3	A	4.20	12.6
Internal	1	A	4.40	4.40
Total	4			17
Grade of a course.	GPA of the course =Total weighted Grade Points/Total weight 17/4 =4.25 = Grade A			

Evaluation- Third stage (to be done by the College)

Semester Grade Point Average (SGPA)

Course code	Title of the course	Credits (C)	Grade Awarded	Grade Points (G)	Credit Points (CP=C X G)
01	PC-1	5	A	4.25	21.25
02	-----	5	A	4.00	20.00
03	-----	5	B+	3.80	19.00
04	-----	2	A	4.40	8.80
05	-----	3	A	4.00	12.00
TOTAL		20			81.05
SGPA	Total credit points / Total credits = 81.05/20 = 4.05= Grade- A				

Evaluation- Fourth Stage (to be done by the College)

Cumulative Grade Point Average (CGPA)

If a candidate is awarded three A+ grades in semester 1 (SGPA of semester 1), semester 2 (SGPA of semester 2) and semester 4 (SGPA of semester 4) and a B grade in semester 3 (SGPA of semester 3). Then the CGPA is calculated as follows:

Semester	Credit of the Semesters	Grade Awarded	Grade point (SGPA)	Credit points
I	20	A+	4.50	90
II	20	A+	4.60	92
III	20	B	3.00	60
IV	20	A+	4.50	90
TOTAL	80			332

CGPA= Total credit points awarded / Total credit of all semesters = 332 / 80

= 4.15 (Which is in between 4.00 and 4.49 in 7-point scale).

Therefore, the overall Grade awarded in the program is A

Programme Design

Semester I

No.	CourseCode	Course Name	Course Category	Hours per week	Credit	Total Credit
1	PCS1CRT0120	Computational Mathematics	Core Course	4	4	19
2	PCS1CRT0220	Advanced Web Technology	Core Course	4	4	
3	PCS1CRT0320	Operating Systems	Core Course	4	4	
4	PCS1CRT0420	Advanced Java Programming	Core Course	3	3	
5	PCS1CRP0120	Lab I [JAVA, PHP]	Core Course	10	4	

Semester II

No	CourseCode	Course Name	Course Category	Hours per week	Credit	Total Credit
1	PCS2CRT0120	Advanced Data Structures	Core Course	4	4	19
2	PCS2CRT0220	Computer Networks	Core Course	4	4	
3	PCS2CRT0320	Research Methodology And Technical Writing	Core Course	3	3	
4	PCS2CRT0420	Database Management System And SQL	Core Course	4	4	
5	PCS2CRP0120	Lab II [DS Using JAVA, SQL]	Core Course	10	4	

Semester III

No	Course Code	Course Name	Course Category	Hours per week	Credit	Total Credit
1	PCS3CRT0120	Digital Image Processing	Core Course	4	4	20
2	PCS3CBT0120	Elective I	Core Course	4	4	
3	PCS3CRT0220	Python Programming	Core Course	4	4	
4	PCS3CBT0320	Software Engineering	Elective	4	4	
5	PCS3CRP0120	LAB III [DIP Using Python]	Core Course	5	2	
6	PCS3CPR0120	Mini Project Using IoT	Core Course	4	2	

Semester IV

No	CourseCode	Course Name	Course Category	Hours per week	Credit	Total Credit
1	PCS4CRT0120	Data Mining	Core Course	5	4	22
2	PCS4CBT0120	Elective I	Elective	5	4	
3	PCS4CBT0220	Elective I	Elective	5	4	
4	PCS4CPR0122	Main Project	Core Course	10	8	
5	PCS4CRV0122	Comprehensive Viva Voce	Core Course		2	

The Elective Bunches

There are three Electives Bunches offered in this PGCSS Program. Each elective consists of a bunch of three theory courses. The first theory course of a bunch are placed in the Semester III, while the second and third are in Semester IV. An institution can select only one Elective Bunch in an academic year. The course structure of the Electives Bunches is given in Table 1.2

The Electives Bunches are named,

(i) Elective I

(ii) Elective II

(iii) Elective III

Table 1.2: The Elective Bunch

Elective I

Semester	Course Title	Hours per week	Credits
3	Introduction to Cyber Security	4	4
4	Big data Management Using R	5	4
4	Pattern Recognition	5	4

Elective II

Semester	Course Title	Hours per week	Credits
3	Statistical Computing for Data Analytics	4	4
4	Data Analytics	5	4
4	Advanced Python Programming	5	4

Elective III

Semester	Course Title	Hours per week	Credits
3	Applied Cryptography	4	4
4	Ethical Hacking	5	4
4	Soft Computing	5	4

Detailed Syllabus: Semester I

Core Course I: Computational Mathematics (PCS1CRT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- Demonstrate the knowledge of Mathematical Logical Concepts in Propositional Calculus, Connectives, Normal forms and Predicate Calculus.
- Familiar with the concepts of Mean, Median and Mode. And also about the Mean deviation and Standard deviation.
- Understand the Correlation& Regression analysis.
- Know about the concept of Automata and Regular expressions.

Module I: (15 Hours)

Mathematical Logic: Propositional Calculus: Statements and notations, Connectives: negation, conjunction, disjunction, statement formulas and truth tables, conditional and biconditional, Well-formed formulas, tautologies, equivalence of formulas, tautological implication. Normal forms: Disjunctive and conjunctive normal forms.

Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse

Module II: (15 Hours)

Basic Statistics: Measure of central value: Introduction, types of average-arithmetic mean: calculation of arithmetic mean-discrete series, continuous series. Median: calculation of median discrete series, continuous series. Mode: calculation of mode- discrete series, continuous series. Measures of dispersion: Absolute and relative measures of dispersion, Range, Mean deviation: calculation of mean deviation-individual observations, discrete series, and continuous series. Standard deviation: calculation of standard deviation- individual observations, discrete series, continuous series, coefficient of variation.

Module III: (17 Hours)

Correlation& Regression analysis: Introduction, correlation and causation, types of correlation, Karl Pearson's coefficient of correlation-direct method of finding out correlation coefficient, calculation of correlation coefficient when change of scale and origin is made. Regression: introduction, regression equation of y on x, regression equation of x on y.

Module IV: (15 Hours)

Theory of Automata: Definition, Description of finite automaton, Transition systems and its properties, Acceptability of a string by a finite-automata, non-deterministic finite state machines, Equivalence of DFA and NDFA, Minimization of finite automata -construction of minimum automaton. Regular sets and regular grammar: Regular expressions, Transition system containing null moves, construction of finite automata equivalent to a regular expression.

Module V: (10 Hours)

Fuzzy logic: Introduction, Crisp set an overview, Fuzzy sets basic types, Basic concepts, Characteristics and significance of paradigm shift.

References

- J.P. Tremblay & R Manohar- Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill. P K Sinha & Priti Sinha – Computer Fundamentals, Fourth Edition, BPB Publications.
- S. P. Gupta- Statistical Methods, Sultan Chand & Sons.
- George J Klir& Bo Yuan- Fuzzy sets and Fuzzy logic Theory and applications, Prenticehall of India.
- K.L.P Mishra & N. Chandrasekaran -Theory of Computer Science (Automata, Languages and Computation), Prenticehall of India.

Core Course II: Advanced Web Technology (PCS1CRT0220)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To define the fundamental ideas and standards underlying Web Service Technology
- To introduce students to HTML and CSS.
- To impart the various operation in PHP and Object Oriented Programming using PHP.
- To understand the Installation and Setup of different web development tools.

Module I: (15 Hours)

Internet introduction, WWW, understanding client/server role, web browsers, web servers, HTML 5 core elements and attributes, text formatting and presentational tags, links, adding images, image maps, lists, tables, HTML 5 form controls- text input, check box, radio button, select box, file select box, buttons, number, date, time, calendar, and range, <nav>, <section>, <article>, <header>, <footer>.

CSS Introduction, <link> and <style>, CSS properties, text pseudo classes.

Module II: (15 Hours)

Java script, document object model, variables, operators, popup boxes, functions, conditional statements, looping, events, built-in –objects, form validation.

Introduction to PHP, server-side scripting, PHP comments, variables, echo and print, PHP operators, data types, branching statements, loops.

Module III: (12 Hours)

Arrays, PHP functions, working with forms, $_GET, $_POST, $_REQUEST, String functions, include and require, session and cookie, error handling in PHP.

Module IV: (15 Hours)

Object Oriented Programming using PHP- classes, objects, constructor, destructor, inheritance, polymorphism, function overriding.

Introduction to MySQL, Database & table creation, database operations-select, insert, update, delete, drop, database connections, functions for managing database connections.

Module V: (15 Hours)

CodeIgniter (PHP MVC Framework) – MVC Overview, Explaining Models, Views, Controllers, Installation, Setup Dreamweaver/NetBeans IDE, Folder Structure

Configuration -Libraries & Helpers, Active Record Class-- Selecting Data, Inserting Data, Updating Data, Deleting Data, Working with Simple Database Program

References

- Steven Holzner, The complete reference PHP 5.2, 5th Edition, Tata McGraw-Hill
- Steven Holzner, The complete reference HTML5 & CSS, 5th Edition, Tata McGraw-Hill Edition
- Steve Suehring, Tim converse and Joyce Park, *PHP6 and MySQL* , Wiley publication
- Ivan Bay Ross, HTML, DHTML, JavaScript, Perl CGI, 4th Edition, BPB Publications

Core Course III: Operating Systems (PCS1CRT0320)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To understand the role of Operating System in a Computer World.
- To learn about Process management.
- To impart an idea on Process Synchronization.
- To understand the concept of Memory management strategies.
- To develop a strong base on Linux.

Module I: (15 Hours)

Computer system architecture – single processor systems, multiprocessor systems, clustered systems. Operating system operations- dual mode and multimode operation. Process management, Memory management, Storage management. Computing Environments- Traditional computing, Mobile computing, Distributed systems, Client Server computing, Peer-to-Peer computing, Virtualization, Cloud computing, Real-time embedded systems. System structures - Operating system services, System calls, Types of system calls, Operating system structure- Simple structure, Layered approach, Microkernals, Modules, Hybrid systems

Module II: (15 Hours)

Process management - Process concept - Process state, PCB, Process Scheduling -Scheduling queues, Schedulers, Context switch, Operations on processes - creation, termination, Inter-process Communication- Shared memory systems, Message Passing systems. Multithreaded Programming - Overview, Multithreading Models. Process Scheduling – Basic Concepts, Scheduling criteria, Scheduling algorithms- FCFS, SJF, Priority scheduling, RR scheduling, Multilevel queue scheduling, Multilevel Feedback queue scheduling.

Module III: (12 Hours)

Process Synchronization - The critical section problem- Peterson's Solution, Synchronization hardware, Mutex Locks, Semaphores, Monitors, Monitor usage.

Deadlocks – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Module IV: (15 Hours)

Memory management- Memory management strategies - Basic hardware, Address binding, Logical vs Physical address space, Dynamic loading, Dynamic linking and shared libraries, Swapping, Contiguous memory allocation, segmentation, Paging - Basic method, Hardware support, Protection, Shared pages.

Virtual memory management: - Demand paging - Basic concepts, Performance of demand paging, Page Replacement, Page Replacement algorithms - FIFO, Optimal page replacement, LRU page replacement.

Module V: (15 Hours)

Case study -The Linux System - Features, Advantages, Linux history, Design Principles, Kernel Modules, Process Management, Scheduling - Process Scheduling, Real-time Scheduling, Virtual Memory, File Systems, Inter-process Communication, Security.

Various types of shells available in Linux - Comparison between various shells - Linux Commands for files and directories - cd, ls, cp rm, mkdir, rmdir, pwd, file, more, less. Creating and viewing files using cat.

References

- Abraham Silberschatz, Galvin, Gange, Operating SsystemConcepts, 9th Edition, Wiley Publishers.
- Milan kovic, Operating Systems, Second Edition.
- Official Red hat Linux Users Guide- Red hat, Wiley Dreamtech India

- Yeswant Kanethkar, Unix Shell Programming, First Edition, BPB
- Christopher Negus, Red Hat Linux Bible -2005 Edition, Wiley Dreamtech India.

Core Course IV: Advanced Java Programming (PCS1CRT0420)

54 Hours 3 Credits

COURSE OUTCOMES

The students will be able

- List and use Object Oriented Programming concepts for problem solving.
- Write programs using Java collection API as well as the Java standard class library.
- Solve the inter-disciplinary applications using the concept of inheritance.
- Apply JDBC to provide a program level interface for communicating with database using Java programming.

Module I: (10 Hours)

Object Oriented Programming Concepts and Basics of Java: Java Programming Environment – JDK, Java Virtual Machine, Bytecode, Features of Java Flow Control Statements – Conditional Statements, Iteration Statements, Jump Statements Arrays –One Dimensional Array, Multi-dimensional Array, Object Oriented Programming Concepts- (Objects and Classes, Encapsulation, Inheritance, Polymorphism), Type of Inheritance, Method Overloading, Method Overriding, Dynamic Method Dispatch

Module II: (12 Hours)

Input/Output Handling: Constructors- Constructor Overloading, this, super, final, abstract and static Keywords, Interfaces Defining an Interface, Implementing Interface, Extending Interfaces. String - String Handling Fundamentals, Comparison of String and String Buffer Class, Special String Operations- Character Extraction, String Comparison, Searching String, Modifying a String, String Copy, Input and Output Streams – Byte Stream, Character Stream.

Module III: (12 Hours)

Packages; Exception Handling and Thread: Packages – Defining Packages, Built in Packages (java.lang, java.util, java.io, java.net, javax.swing), Importing Packages, Implementation of User Defined Packages, Access Protection in Java,

Exception Handling - try, catch, throw, throws and finally Statements, Java's Built-in Exceptions, Creating User Defined Exceptions. Threads- Thread Lifecycle, Thread Priorities, The Thread Class, Runnable Interface, Creating a Thread – Implementing Runnable, Extending Thread, Inter Thread Communication, Suspending Resuming and Stopping Threads.

Module IV: (10 Hours)

GUI Programming : Basic Event Handling – Delegation Event Model, Important Event Classes And Listener Interfaces, Handling Mouse and Keyboard Events, Adapter Classes, Swing -Window Fundamentals – Class Hierarchy, Frame, Creating a Simple Window Based Application, ImageIcon, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JList, JComboBox, JTable, JTabbedPane, JScrollPane, Layout Management – The FlowLayout, BorderLayout, GridLayout, CardLayout.

Module V: (10 Hours)

File, Database and Networking: File Management - Reading and Writing Files (FileInputStream and FileOutputStream Classes), Networking Basics- Networking Classes and Interfaces, InetAddress, TCP/IP Client Sockets, URL Connection, TCP/IP ServerSockets, JDBC - The Design of JDBC, JDBC Configuration, Executing SQL Statements- Scrollable and Updatable ResultSets, RowSets, Transactions.

References

- Herbert Schildt, Java 2 The Complete Reference, Tata McGraw Hill (5thEdn.)
- James. P. Cohoon, Programming java5.0, Jack. W. Davison (Tata McGraw Hill).
- C Thomas Wu, An introduction to Object Oriented Programming with Java, Tata McGraw Hill, (2006) .
- Wigglesworth and McMillan, Java Programming: Advanced Topics, Cengage Learning India, 3rdEdn
- Bernard Van Haecke, JDBC:Java Database Connectivity, , IDG Books India (2000).

Core Course V: Lab I [Java & PHP] (PCS1CRP0120)

54 Hours 3 Credits

COURSE OUTCOMES

The students will be able

- To develop adequate skills in programming and will be known to understand the implementation of various applications using Java and PHP.

Syllabus:

JAVA

1. Basic Concepts and File Handling

1.1. Inheritance, Polymorphism

1.2. Constructors

1.3. Interface

1.4. Package

1.5. One Dimensional and Two-Dimensional Array Manipulation

1.6. String Handling (Character Extraction, String Comparison, Searching String, Modifying a String, String Copy)

1.7. Exception (Built-in and User Defined)

1.8. Thread (Using Runnable Interface and Thread Class)

1.9. File management (File reading, Writing, Appending and Content Replacing)

2. GUI, Database and Networking

2.1. Event Handling (Keyboard and Mouse Events)

2.2. Working with Swing (ImageIcon, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JList, JTable)

2.3. Layout Management (The FlowLayout, BorderLayout, GridLayout, CardLayout)

2.4. Simple Programs of Database Connectivity

PHP

1. Create a calendar of the month of January 2019 using HTML.
2. Design a page for the inauguration of your department association using HTML & CSS.
3. Create and validate a bio data form using JavaScript and HTML.
4. Create a JavaScript program to display today's date and current time.
5. Program to check whether the string is palindrome or not using PHP.
6. Create a Login page by using PHP and session.
7. Create a simple online quiz page using PHP and MySQL.
8. Create a simple user registration page in PHP.
9. Create an E- mail registration form using Code igniter.
10. Create an online shopping cart using Code igniter.

Detailed Syllabus: Semester II

Core Course VI: Advanced Data Structures (PCS2CRT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To choose appropriate data structures to represent data items in real world problems.
- To analyze the time and space complexities of algorithms.
- To design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees.
- To analyze and implement various kinds of searching and sorting techniques.

Module I: (15 hours)

Concept of data structures, types of data structures, examples.
Introduction to algorithms, Performance analysis-Space complexity, Time complexity, Amortized complexity, Asymptotic notations, Performance measurement; various algorithm designing techniques-Divide and conquer, Greedy method, Dynamic programming, Backtracking, Branch and bound, *Np*-hard and *Np*-completeness problems.

Module II: (15 Hours)

Arrays: Organization, Representation and implementation of arrays, examples. Implementation of Stacks and Queues, Circular Queues, Priority Queues, Double ended queues, Applications of stacks and queues.

Sorting and Searching techniques: Linear and Binary search, Selection sort, Merge sort, Simple insertion sort, Quick sort, Shell sort, Radix sort.

Module III: (12 Hours)

Lists: Representation and implementation of singly linked list, Circular linked lists, doubly linked list, Linked list representation of stacks and queues, examples.

Dynamic storage management. Boundary tag system. Garbage collection and compaction.

Module IV: (15 Hours)

Trees: Representation and Implementation, Binary trees, insertion and deletion of nodes in binary tree, binary tree traversals, Binary search trees, Threaded Binary trees, Balanced trees (AVL trees), B- trees- Insertion and Deletion of nodes, Tree search.

Module V: (15 hours)

Graphs: Directed Graphs, Shortest Path Problem, Undirected Graph, Spanning Trees, Techniques for graphs –Breadth First Search (BFS) and traversal, Depth First Search (DFS) and traversal

Hashing: Static hashing, hash tables, hash functions, overflow handling.

References

- Robert Lafore, Data structures and Algorithms in Java, Pearson Publications
- Clifford A Shaffer , Data Structures and Algorithm analysis in Java
- Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Computer Algorithms/C++, University press publications
- G S Baluja, Data structures Through C++
- Ellis Horowitz and SartajSahni, Fundamentals of Data structures

Core Course VII: Computer Networks (PCS2CRT0220)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To describe how computer networks are organized with the concept of layered approach.
- To implement a simple LAN with hubs, bridges and switches.
- To analyze the contents in a given Data Link layer packet, based on the layer concept.
- To describe how packets in the Internet are delivered.
- To describe how routing protocols work.

Module I: (15 hours)

The OSI Model- Layered architecture, Peer-to-Peer process, Encapsulation. Layers in the OSI Model- Physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation layer, Application layer. TCP/IP protocol suite. Addressing- Physical addresses, Logical addresses, Port addresses, Specific addresses. Physical Layer: Transmission media

Guided media- Twisted pair, Coaxial, Fiber-optic Cables. Unguided Media- Radio waves, microwaves, infrared waves. Switching-Packet switched networks, Datagram Networks, Virtual circuit networks.

Lab- Different types of LAN cables, connectors, Hub, Switch, Router, and Configuration of star LAN (Ethernet LAN).

Module II: (15 Hours)

Data Link Layer: Framing, Flow and Error Control, Protocols, Noiseless channels- simplest, stop-and-wait protocols. Noisy channels- Stop and wait ARQ, Go-Back NARQ, Selective Repeat ARQ. Piggybacking. Random access protocols- Aloha (Pure& slotted), CSMA,

CSMA/CD, CSMA/CA. Standard Ethernet- MAC sub layer, Frame format. Fast Ethernet, Gigabit Ethernet. Wireless LAN (IEEE 802.11)- Architecture, MAC sub layer, Frame format, Addressing mechanism, Physical layer. Bluetooth- Architecture, Bluetooth layers, Frame format. Connecting Devices- Hubs, Switches, Routers, Gateway.

Lab-connecting two LAN using a switch.

Module III: (17 Hours)

Network Layer: IPv4 Addresses- Address space, Notations, Classful addressing, Classless addressing, NAT. IPv6 Addresses- Structure, Address space. Internet Protocol (IP)- IPv4 Datagram format, IPv6- Advantages, Packet format. Transition from IPv4 to IPv6- Dual stack, Tunneling, Header translation. Address mapping protocols: ARP, RARP, BOOTP, DHCP. Error Reporting protocol: ICMP- Types of Messages, Message format, Error Reporting, Query. Multicasting Protocol: IGMP- Group management, IGMP messages, Message format, IGMP operations. Forwarding- Forwarding Techniques, Forwarding process, Routing table. Unicast routing protocols- Distance vector routing (RIP), Link state routing (OSPF), Path vector routing (BGP).

Lab: Configuring Wireless LAN (WiFi)

Module IV: (10 Hours)

Transport layer: User Datagram Protocol (UDP)- Well-known ports for UDP, Datagram format, UDP operation, Use of UDP. TCP- TCP services, TCP features, TCP segment format, TCP connection- connection establishment, connection termination. SCTP-SCTP services, SCTP features, SCTP packet format, SCTP association- association establishment, data transfer, association termination. Congestion control- open loop congestion control, closed loop congestion control.

Module V: (15 Hours)

Application layer: Domain Name System- Name space, Domain name space, Distribution of Namespace, DNS in the Internet- Generic domains, Country domains, Inverse domains. Resolution- Resolver, Recursive resolution, iterative

resolution. DNS message. Types of records. DDNS (Dynamic Domain Name System). TELNET- Logging, Network virtual terminal, options, mode of operation. E-mail- Architecture, User Agent, Message Transfer Agent (SMTP), Message Access Agent: POP, IMAP. Web-based mail. FTP: Basic model of FTP, Control connection, Data connection, Anonymous FTP. HTTP protocol- HTTP transaction, Message formats, Persistent and Non persistent connection, Proxy server.

References

- Behrouz Forouzan- Data Communication & Networking – Fourth Edition - The McGraw-Hill Companies, Inc.
- James F. Kurose & Keith W. Ross - Computer Network – Top down approach – 7th Edition - Pearson Education, Limited
- Behrouz A. Forouzan - TCP/IP Protocol Suite – 4th Edition - McGraw-Hill

Core Course VIII: Research Methodology and Technical Writing (PCS3CRT0320)

72 hours 4 Credits

COURSE OUTCOME

The students will be able

- To understand the basic concepts of Research Methodology.
- To learn how to design a research.
- To understand of Data Collection and Analysis.
- To practice reporting and thesis writing.
- To learn Ethics in Research.

Module I: (12 Hours)

Research Methodology: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research.

Module II: (15 Hours)

Research Design: Reading and Reviewing-Research literature, Finding Research Papers, Critical Reading, Developing a literature Review, Guidelines for Research Skills and Awareness, Validity of Research, Reliability in Research. Meaning of Research Design, Need for Research Design, Features of good design, Different Research Designs.

Module III: (15 hours)

Data Collection and Analysis: Introduction, Need for Data Collection, Methods of Data Collection, Principles for Accessing Research Data, Data Processing, Data Analysis, Presentation of Data, Error Analysis, Scientific Models. Scientific Methodology - Introduction Rules and Principles of Scientific Method,

Hypothesis, Testing of Hypothesis, Basic concepts, Procedure, Important parametric tests: z-test, t-test, χ2-square test, F test.

Module IV: (15 Hours)

Reporting and thesis writing Presentation of algorithms, Environment of Algorithms, Asymptotic Cost. Graphs. Technical Reports- Structuring General format, Report-Bibliography referencing and footnotes. Research in Practice-Literature Review, Journals, Conference Proceedings, journal Impact Factor, citation Index, h Index. Application of Computer in Research --MS office and its application in Research, Use of Internet in Research – Websites, search Engines, E-journal and E-Library.

Module V: (15 Hours)

Ethics in Research –Research Ethics, Importance of Ethics in Research, Ethics values and Principles, Some Ethical issues ,Plagiarism, Misuse of Privileged Information, Misuse of Data, Authorship and other publication issues, meaning of Copy Right, Copy Right and Information Technology

References

- Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. Publishers (Second revised edition)
- Justin Zobel, Writing for Computer Science, Springer (Third Edition)
- K Prathapan, Research Methodology for Scientific Writing, I.K International Publishing House Pvt. Ltd.
- Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
- S.P Satarkar, S.V., 2000. Intellectual Property Rights and Copy right. ESS Publications.

Additional reading

- Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.

- Day, R.A., 1992.How to Write and Publish a Scientific Paper, Cambridge University Press.
- Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
- Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.
- Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.
- Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

Core Course IX: Database Management System and SQL (PCS2CRT0420)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To understand the basic concepts of data bases and data base management system.
- To learn the relational data bases design requirements.
- To know structured query language and writing queries.
- To learn the Object -Oriented Database Management Systems.

Module I: (12 Hours)

Database, need for DBMS, users, DBMS architecture, data models, views of data, data independence, database languages, Relational Model-Basic concepts, keys, integrity constraints, ER model-basic concepts, ER diagram, weak entity set, ER to Relational, relationships, generalization, aggregation, specialization.

Module II: (15 Hours)

Codd's rules, Relational model concepts , Relational algebra- Select, Project, Join, Relational calculus-tuple relational calculus and domain relational calculus, Specifying constraints management systems, Anomalies in a database, Functional dependencies, Normalization- First, Second, Third, Boyce Codd normal forms, multi-valued dependency and Fourth normal form, Join dependency and Fifth normal form.

Relational database query languages-Basics of SQL, Data definition in SQL-Data types, Creation, Insertion, Viewing, updation, Deletion of tables, Modifying the structure of the tables, Renaming, Dropping of tables, Data constraints-I/O constraints, ALTER TABLE command

Module III: (15 Hours)

Database manipulation in SQL- Computations done on the table- Select command, Logical operators, Range searching, Pattern matching, Grouping data from tables in SQL, GROUP BY, HAVING clauses, Joins- Joining multiple tables, Joining tables to itself, DELETE, UPDATE, Views- Creation, Renaming the column of a view, Destroys view- Program with SQL, Security locks, Types of locks, Levels of locks, Cursors - working with cursors, error handling, Developing stored procedures,-Creation, Statement blocks, Conditional execution, Repeated execution, Cursor-based repetition, Handling Error conditions, Implementing triggers, Creating triggers, Multiple trigger interaction.

Module IV: (15 Hours)

Concept of transaction, ACID properties, serializability, states of transaction, Concurrency control, Locking techniques, Time stamp based protocols, Granularity of data items, Deadlock, Failure classifications, storage structure, Recovery & atomicity, Log base recovery, Recovery with concurrent transactions, Database backup & recovery, Remote Backup System, Database security issues.

Module V: (15 Hours)

Object Oriented Database Management Systems (OODBMS) - concepts, need for OODBMS, composite objects, issues in OODBMSs, advantages and disadvantages of OODBMS. Distributed databases - motivation - distributed database concepts, types of distribution, architecture of distributed databases, the design of distributed databases, distributed transactions, commit protocols for distributed databases.

References:

- Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson
- Abraham Silbersehatz, Henry F. Korth and S.Sudarshan, Database System Concepts, 6 th Edition, Tata McGraw-Hill

- JamesR.Groff and Paul N. Weinberg The complte reference SQL Second edition,Tata McGraw Hill

Core Course X: Lab -II [DS using Java, SQL] (PCS2CRP0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To develop adequate skills in programming and will be known to understand the implementation of Data structures using Java and get the knowledge in creating database using SQL queries To gain experience of object oriented language programming.

Advanced Data structures using Java

1. Array implementation – Insertion of new element into a specified position, Deletion of an element from the specified position within the array
2. Stack implementation – PUSH, POP and Traverse
3. Queue implementation –Insertion, deletion and Traverse
4. Circular Queue implementation –Insertion, deletion and Traverse
5. Double ended queue implementation –Insertion, deletion and Traverse
6. INFIX to POSTFIX Conversion
7. INFIX to PREFIX conversion
8. POSTFIX evaluation
9. Searching - Linear and Binary search using arrays
10. Sorting – Selection sort, Merge sort, Simple insertion sort, Quick sort, Shell sort, Radix sort
11. Lists implementation - Singly linked list, Circular linked list, doubly linked list Dynamic array implementation- Linked list representation and implementation of stack and queue operations
12. Creation of binary tree, counting no. of nodes and display the nodes in a tree
13. Searching a node in a binary tree
14. Insertion and deletion of nodes in a B-Tree
15. Graphs – Implementation of BFS and DFS.

SQL

1. Creating database tables and using data types (create table, modify table, drop table).

2. Data Manipulation (adding data with INSERT, modify data with UPDATE, deleting records with DELETE).

3. Implementing the Constraints (NULL and NOT NULL, primary key and foreign key Constraint, unique, check and default constraint).

4. Retrieving Data Using SELECT (simple SELECT, WHERE, IN, BETWEEN, ORDERED BY, DISTINCT and GROUP BY).

5. Aggregate Functions (AVG, COUNT, MAX, MIN, SUM).

6. String functions.

7. Date and Time Functions.

8. Use of union, intersection, set difference.

9. Implement Nested Queries & JOIN operation.

10. Performing different operations on a view.

11. Stored Procedure Programming – Simple Procedures – decision making – Loops – Error handlers – Cursors – Functions - Triggers – Calling Stored Procedure from Triggers

Detailed Syllabus: Semester III

Core Course XI: Digital Image Processing (PCS3CRT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- Review the fundamental concepts of a digital image processing system.
- Evaluate the techniques for image enhancement.
- Analyze images in the frequency domain using various transforms.
- Study the image restoration and compression procedures.
- Interpret image segmentation and representation techniques.

Module I: (15 Hours)

Fundamentals of Image Processing –Definition of Image, Digital Image and Digital Image Processing, Examples of fields that use Digital Image Processing, Fundamental steps in image processing, Components of Image Processing system, Elements of Visual perception, Image sensing and acquisition, Image sampling and quantization, Relationships between pixels– Color image fundamentals – Color Models-RGB, CMY, HSI

Module II: (15 Hours)

Image Enhancement in spatial domain – Basic Intensity transformation functions – Image Negatives, Log Transformations, Power Law Transformations, Piecewise Linear Transformations, Histogram processing, Enhancement using arithmetic, logic operations- Image Subtraction and Image averaging – Fundamentals of spatial filtering ,Smoothing spatial Filters.

Module III: (12 Hours)

Image Enhancement in Frequency domain – Introduction to Fourier transform: 1- D, 2 –D DFT and its Inverse Transform, Properties of 2-D DFT, Image Smoothing and Sharpening using Frequency Domain Filters- Ideal, Butterworth and Gaussian filters and Homomorphic filtering.

Module IV: (15 Hours)

Image restoration and Compression: A Model of Image degradation and

restoration process – Noise models-Gaussian Noise, Rayleigh Noise, Gamma Noise, Exponential Noise, Impulse Noise, Restoration using Mean Filters, Order Statistics filters, Adaptive filters. Compression- Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG.

Module V: (15 Hours)

Image Segmentation –Fundamentals, Edge detection-Gradient operator, Marr-Hildreth edge detector, canny edge detector, Thresholding- Global Thresholding using otsu's method, Variable Thresholding, Region based segmentation – Region growing, Region splitting and merging, Segmentation using morphological watersheds.

References

- Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2014.
- Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
- Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall, Fourth Edition,1989.
- William K. Pratt, Digital Image Processing, John Wiley, Fourth Edition, New York, 2002.
- Milan Sonka et al, Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, Fourth edition, 2007.

Core Course XII: Python Programming (PCS3CRT0220)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To l earn and understand Python programming basics and python looping and control statements.
- To learn and understand text files and string manipulations.
- To define and demonstrate the use of built-in data structures such as lists, tuples and dictionary and familiar with the concepts of python functions.
- To understand python modules, packages and simple graphics
- To learn and know the concepts of file handling

Module I: (15 Hours)

Introduction-Features of Python, Installation, Basic Syntax, Variables and Datatypes, Operators- Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators, Casting. Conditional Statements-if, if-else, Nested if-else. Looping Statements-for, while, Nested loops. Control Statements-break, continue, Pass.

Module II: (17 Hours)

Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).
String Manipulations-Accessing Strings, Basic Operations-extract, replace, len, lower, upper, split, substrings, String slices, strings and number system: converting strings to numbers and vice versa, String Methods.

Module III: (15 Hours)

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element, searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
Functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments, Recursive functions

Module IV: (15 Hours)

Modules & Packages: Creating Modules, import Statement, Locating Modules, Namespaces and Scope, Packages, Date and Time Modules.

Simple Graphics and Image Processing: "turtle" module; simple 2d drawing - colors, shapes, digital images, image file formats, image processing Simple image manipulations with 'image' module.

Module V: (10 Hours)

File Operations-Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines() ,Manipulating file pointer using seek Programming using file operations

References

- Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.
- Mark Summerfield, Programming in python 3:second edition.
- Charles Dierbach, "Introduction to Computer Science using Python", Wiley, 2015.
- R Nageswara Rao, Python Programming.

Core Course XIII: Software Engineering (PCS2CRT0320)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To learn Software Engineering principles and approach used in industry.
- To demonstrate agility in solving software and system challenges and able to use Unified Modeling Language in software specification documents.
- To choose appropriate process model depending on the user requirements.
- To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.
- To apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes.

Module I: (10 Hours)

Introduction-Software engineering, Software process, SE practices, Process models- Generic process models, Prescriptive process model, Specialized process model, The unified process model.

Module II: (15 Hours)

Agile Development-Agility, Agility and cost of change, Agile process, Extreme programming, Adaptive software development, Scrum, Dynamic system development method, Feature driven development, Agile Modeling, Agile Unified Process.
Introduction to UML: Class Diagram, Deployment Diagram, Use-Case Diagram, Sequence Diagram, Communication Diagram, Activity Diagram, State Diagram

Module III: (15 Hours)

Understanding Requirements-Requirement engineering, Building the Requirement model

Requirement modeling approaches-Scenario based modelling, UML Model that supplement the Use Case, Data modelling concepts Class Based modeling -Class responsibility collaborator modelling, Flow oriented modelling, Creating a behavioral model.

Module IV: (17 Hours)

Software Design-Design concepts-The Design Model, Architectural Design-Architectural styles and design, Architectural mapping using data flow, Component level design-Design guidelines, conducting component level design, Component based development, User Interface Design-Golden rules, Interface design steps.

Testing- Software testing strategy-A Strategic Approach to software testing. Testing conventional applications-White box testing, Black box testing, Testing object-oriented applications-Object-oriented testing methods.

Module V: (15 Hours)

Software project management-Software measurement, Metrics for software quality, Software project estimation-Decomposition technique, Empirical estimation model-The COCOMO11 Model. Project scheduling-basic principles-Defining a task set, Defining a task network, scheduling. Risk management-Software Risks, Risk identification, Risk projection, Risk refinement, THE RMMM PLAN.

References

- Roger S. Pressman, Software Engineering: A Practitioner's Approach McGrawHill International Edition. 7th Edition.
- Carlo Ghezzi, Mehdi Jazayeri. Dino Mandrioli: Fundamentals of software Engineering, Second Edition.

- Richard Fairley: Software Engineering Concepts", Tata McGraw Hill Edition 1997

- Martin I. Shooman: "Software Engineering – Design Reliability and Management, McGraw Hill International Edition.

Core Course XIV: Lab III [DIP Using Python] (PCS3CRP0120)

36 Hours 2 Credits

COURSE OUTCOMES

The students will be able to

- To develop adequate skills in programming and will be known to understand the implementation of various applications using Python and Digital Image Processing.

Python

1. Programs using elementary data items, lists, dictionaries and tuples
2. Programs using conditional branches, loops.
3. Programs using functions
4. Programs using exception handling
5. Programs using classes and objects
6. Programs using inheritance
7. Programs using polymorphism
8. Programs to implement file operations.
9. Programs using modules.

Digital Image Processing

1. Program to input gray scale image and color image, convert image to array of numbers and perform rotations on the image.
2. Program for conversion between colour spaces RGB, CMY, HSI.
3. Program to find histogram value and display histogram of a grayscale and color image.
4. Program to apply basic intensity transformations.
5. Program to Implement 2-D DFT and Transform domain Filtering.
6. Program to read a grayscale image, corrupt the image using any noise models and apply mean filters or adaptive median filters to remove the

noise.

7. Program for edge detection using gradient operators.
8. Program to Segment the image using Thresholding.

Core Course XV: Mini Project Using IoT (PCS3CPR0120)

36 Hours 2 Credits

COURSE OUTCOME

The students will be able

- To learn physical design, logical design and enabling technologies of Internet of Things.
- To study IoT case studies using Python.
- To acquire knowledge about IoT platforms design methodology.
- To learn about IoT physical servers and cloud offerings.
- To build physical and logical design of IoT systems.

Module I: (7 Hours)

Advanced Programming with Python: Basic operators and variables, Decision Making and Loops, Modules, Exception Handling, Classes, Function, Multithreading, GUI Programming, email using SMTP.

Introduction to IoT: Evolution of internet, Components and architecture of IoT, Types and requirements of IoT network, Protocols, Standards and Communication Technologies., IoT application areas.

Module II: (7 Hours)

Arduino IDE: Arduino Software Development, Interaction of Arduino board With Computers, GPIO Programming with Arduino, ADCs, Custom Library for Arduino IDE. Sensor Interfacing with Arduino IDE: Temperature sensor LM 35, Humidity sensor DHT-11., PIR sensor, Distance Measurement using HC SR 04, Gas Sensor interfacing using MQxx Series, LCD interfacing, SMS using GSM Module, Weight measurement using load cell.

Module III: (7 Hours)

Raspberry Pi: Linux basics, Linux commands, RPi models, RPi programming languages and Operating Systems, GPIO Interfacing, 1 wire driver, SPI and I2C protocol, MCP3008 ADC. Sensor Interfacing with RPi: Remote desktop of RPi Using SSH and VNC, LED and switch Interfacing, DS18B20 temperature sensor, Heart beat sensor, RPi FM Radio, Stepper motor, Servo motor, Gas sensor interfacing, Relay interfacing, Arduino and RPi.

Module IV: (7 Hours)

Image Processing: Introduction to OpenCV, GUI Features, Image Processing in open CV: Image thresholding, Smoothing images, Image Edge Detection, Template Matching, Foreground Extraction using GrabCut Algorithm. Rpi camera interfacing: Camera Calibration, Face Detection using Haar Cascades, Feature Matching.

Cloud: Deployment models of cloud, Cloud configuration using Amazon cloud/thing speak.

Module V: (8 Hours)

Project:

1. Real time patient monitoring system using IoT and Cloud
2. Real time remote user authentication using face recognition
3. Implementation of a smart vehicle using IoT
4. IoT base waste management/ smart city application
5. Barcode/QR code-based library access system
6. Implementation of a smart home using sensors and open CV model
7. Weather station Using IoT and OpenCV
8. Traffic monitoring using IoT and OpenCV
9. Real time video streaming to thingspeak / youtube using RPi
10. Cloud based attendance monitoring using face recognition

References

- Internet of Things: architecture and design principles, TRaj Kamal, McGraw Hill Company

- Internet of Things: Architectures, Protocols and Standards, By Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, Wiley and sons
- The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart cities are changing the world By Michael Miller.
- K M Abubeker et al , "IoT based real time patient monitoring and analysis using Raspberry Pi 3, ieeexplore digital library, ICECDS-2017, DOI: 10.1109/ICECDS.2017.8389932

Detailed Syllabus: Semester IV

Core Course XIX: Data Mining (PCS4CRT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Understand the basic concepts of Data Warehouse and Data Mining techniques.
- Examine the types of the data to be mined and apply pre-processing methods on raw data.
- Discover and measure interesting patterns from different kinds of databases.
- Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

Module I: (15 Hours)

Introduction: What is Data mining? Data Mining Tasks, KDD process, Data Mining Functionalities, Mining Frequent Patterns, Associations and Correlations, Classification and Prediction, Cluster Analysis, Classification of Data Mining systems, Major issues in Data Mining, Data objects and Attribute types- Nominal, Binary, Ordinal and Numeric attributes, Measuring the central tendency- Mean, Median and Mode. Data Warehouse, Multidimensional Data Model-Data Cubes, Schemas for multidimensional models-Stars, Snowflakes and Fact Constellations.

Module II: (15 Hours)

Data Preprocessing: Needs of Pre-processing the Data, Data Cleaning- Missing Values, Noisy Data, Data Cleaning as a Process. Data Integration- Redundancy and correlation analysis, Data Reduction- Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, PCA. Data Transformation strategies, Data transformation by Normalization, Discretization by Binning, Histogram Analysis

Module III: (15 Hours)

Association Analysis- Frequent patterns, Basic terminology in association analysis- Binary representation, Itemset and support count, Association Rule,

Support and Confidence, Frequent Item set generation- The Apriori Algorithm, Generating Association Rules from Frequent Itemsets, FP Growth algorithm, Pattern evaluation Methods- How strong association rules can be uninteresting and misleading, From Association Analysis to Correlation Analysis, Constraint-Based Frequent pattern Mining, Metarule-Guided Mining of Association Rules.

Module IV: (15 Hours)

Classification :- Basic concepts, General approach to classification, Decision Tree Induction, Basic Decision Tree algorithm, Attribute Selection Measures- Information Gain, Gain Ratio, Gini Index, Tree Pruning. Bayes Classification methods- Bayes' Theorem, Naïve Bayesian Classification, Rule-based Classification - Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering Algorithm. Metrics for evaluating classifier performance, Cross validation. Classification by Back propagation- A Multilayer Feed-Forward Neural Network, Defining a Network Topology, Backpropagation, Inside the Black Box: Backpropagation and Interpretability.

Module V: (12 Hours)

Cluster Analysis: Introduction, Basic Clustering methods- Partitioning methods- k-Means and k-Medoid. Hierarchical Methods - Agglomerative and Divisive Hierarchical Clustering. Density Based Methods - DBSCAN, OPTICS, DENCLUE. Grid Based- STING, CLIQUE, Outlier Analysis- what are outliers, Types of outliers, Outlier detection methods - Statistical Distribution-Based Outlier Detection, Distance-Based Outlier Detection.

References

- Jiawei Han & Micheline Kamber,Data Mining, Concepts and Techniques, , 3rd Edition.
- Pang Ning Tan, Michael Steinbach and Vipin Kumar,Introduction to Data Mining, Pearson India Education Services
- Arun K Pujari, Data Mining Techniques, , University Press
- Sam Anahory& Dennis Murray,Data Warehousing in the Real World, Pearson Education, Asia.
- PaulrajPonnaiah, Data Warehousing Fundamentals,Wiley Student Edition

Elective Courses

Elective I: 1. Introduction to Cyber Security (PCS3CBT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able

- To make students familiar with the fundamental concepts of computer attacks.
- Develop policies and procedures to manage enterprise security risks.
- Design, develop, test and evaluate secure software.
- Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
- Understand the linkage between technology, law and ethics and IT Act.

Module I (15 Hours)

What Is Computer Security?, Values of Assets, Threats, Confidentiality, Integrity, Availability,, Types of Threats, Types of Attackers, Harm, Risk and Common Sense, Method–Opportunity–Motive, Controls, Authentication, Identification Versus Authentication, Authentication Based on Phrases and Facts: Something You Know, Authentication Based on Biometrics: Something You Are, Authentication Based on Tokens: Something You Have.

Module II (15 Hours)

Access Control, Access Policies, Implementing Access Control, Procedure-Oriented Access Control, Role-Based Access Control. Cryptography, Problems Addressed by, Encryption, Terminology. Malicious Code—Malware, Malware—Viruses, Trojan Horses, and Worms, Technical Details: Malicious Code. Countermeasures for Users. Email Attacks, Fake Email, Fake Email Messages as Spam, Fake (Inaccurate) Email Header Data Phishing, Protecting Against Email Attacks.

Module III (12 Hours)

Security in Operating Systems, Security Features of Ordinary Operating Systems, Protected Objects, Operating System Tools to Implement Security, Functions, Security in the Design of Operating Systems ,Simplicity of Design, Layered Design, Kernelized Design Reference Monitor, Correctness and

Completeness, Secure Design Principles Trusted Systems, Trusted System Functions.

Module IV (15 Hours)

Threats to Network Communications Interception: Eavesdropping and Wiretapping, Modification, Fabrication: Data Corruption, Interruption: Loss of Service, Port Scanning.

Denial of Service, How Service Is Denied, Flooding Attacks in Detail, Distributed Denial-of- Service, Scripted Denial-of-Service Attacks ,Bots, Botnets, Firewalls, What Is a Firewall?, Design of Firewalls Types of Firewalls, Intrusion Detection Systems, Types of IDSs.

Module V (15 Hours)

Security Requirements of Databases, Integrity of the Database, Element Integrity, Auditability, Access Control, User Authentication, Availability, Integrity/Confidentiality/Availability.

Information Technology Act 2000, Cyber Crimes- Computer Crime, Nature of Crimes, Penalty for damage to computer, Computer system, Tampering with Computer source documents, Hacking, Computer related offences.

References

- Charles P. Pfleeger ,Shari Lawrence Pfleeger ,Jonathan Margulies - Security in Computing, Fifth Edition
- Barkhs and U. Rama Mohan, "Cyber Law Crimes", Asia Law House, New Edition
- Sood,"Cyber Laws Simplified", Mc Graw Hill

Elective I: 2. Big Data Management Using R (PCS4CBT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Explain concepts related to big data which includes the big data ecosystem and technologies
- Learn data analytics life cycle.
- Learn advanced analytics techniques.
- Manipulate data using R on a big data Platform.

Module I (15 Hours)

Introduction to Big Data Analytics Big Data Overview - Data Structures-Analyst Perspective on Data Repositories. State of the Practice in Analytics – BI versus Data Science-Current analytical architecture. Drivers of big data Emerging big data Ecosystem and a new approach to Analytics. Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics.

Module II (17 Hours)

Data Analytics Lifecycle: Data Analytics Lifecycle Overview – Key roles for a successful Analytics project. Background and overview of data analytics life cycle. Phase 1: Discovery - Learning the business domain-resources-framing the problem-identifying key stakeholders- Interviewing the analytics sponsor-developing initial hypotheses-Identifying Potential Data sources. Phase 2: Data Preparation - Preparing the Analytic Sandbox-performing ETLT- Learning about the data. Data conditioning-Survey and visualize-Common tools for the data preparation phase. Phase 3: Model Planning: Data exploration and variable selection. Model selection – common tools for the model planning phase- Phase 4: Model Building – common tools Phase 5: Communicate Results - Phase 6: Operationalize.

Module III (10 Hours)

Text Analysis: Text Analysis Steps - A Text Analysis Example - Collecting Raw

Text - Representing Text - Term Frequency - Inverse Document Frequency (TFIDF) Categorizing Documents by Topics. Advanced analytics: Analytics for unstructured data. Use cases –Map reduce-Apache Hadoop. The Hadoop echosystem: Pig-Hive-HBase-Mahout-NoSQL.

Module IV (15 Hours)

Communicating and Operationalizing an analytics project. Creating the final deliverables. Developing core material for multiple Audiences-Project goals-Main findings – approach- Model description- Key points supported with data. Model details- Recommendations- Additional tips on final presentation-Providing technical specification and code. Data visualization basics: Key Points Supported with data. Evaluation of a graph-Common representation methods-How to clean up a graphic - Additional considerations.

Module V (15 Hours)

Introduction to R – Basics - Download & Install R, RStudio - R Data Types: Arithmetic & Logical Operators - R Matrix: Create, Print, add Column, Slice - Data Frame: Create, Append, Select, Subset, Factor in R: Categorical & Continuous Variables - R

Data Preparation

Data Frame: Create, Append, Select, Subset - List in R: Create, Select Elements - R Sort a Data Frame using Order() - R Dplyr: Data Manipulation(Join) & Cleaning(Spread) - Merge Data Frames in R: Full and Partial Match - Functions in R Programming, IF, ELSE, ELSE IF, For Loop in R using List and Matrix - While Loop in R - apply(), lapply(), sapply(), tapply() Function in R - Import Data into R: Read CSV, Excel - Replace Missing Values(NA) in R - R Exporting Data to Excel, CSV, Text File - Correlation in R: Pearson & Spearman with Matrix Example - R Aggregate Function: Summarise &Group_by() - R Select(), Filter(), Arrange(), Pipeline

Data Analysis - Scatter Plot in R using ggplot2 - Boxplot in R - Bar Chart & Histogram in R.

References

- EMC Education Services, "Data Science and Big Data Analytics", WILEY

- Bart Baesens – "Analytics in a Big Data World ", WILEY
- Mark Hornick, Tom Plunkett - "Using R to Unlock the Value of Big Data "
- R programming for Data Science – Roger D Peng

Elective I: 3. Pattern Recognition (PCS4CBT0220)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Understand basic concepts in pattern recognition
- Gain knowledge about the algorithms used in pattern recognition research
- Understand pattern recognition theories, such as Bayesian classifier, linear discriminant analysis.
- Apply pattern recognition techniques in practical problems.

Module I (15 Hours)

Introduction – Pattern recognition systems – The design cycle –Learning and Adaptation - Bayesian Decision theory - Introduction - Continuous features - two-category classification - Minimum error rate classification - Classifiers, Discriminant functions and Decision Surfaces – The normal density - Discriminant Functions for the Normal Density- Error probabilities and Integrals

Module II (15 Hours)

Parameter estimation and supervised learning - Maximum likelihood estimation - Bayesian estimation – Bayesian Parameter Estimation Gaussian case and general theory - Nonparametric techniques – Density estimation - Parzen Windows - kn-Nearest Neighbour Estimation - Nearest-Neighbour Rule – k-Nearest Neighbour Rule.

Module III (15 Hours)

Linear Discriminant Functions - Linear discriminant functions and decision surfaces – Generalized linear discriminant functions – Two-category linearly separable case - Non- separable behavior - Linear programming algorithms - Support vector machines - Multilayer neural networks – Feedforward operation and classification - Backpropagation algorithm - Error surfaces -

Backpropagation as feature mapping.

Module IV (12 Hours)

Stochastic methods – Stochastic search- Boltzmann learning – Nonmetric methods - Decision trees – CART – Other tree methods - Grammatical methods - Grammatical inference.

Module V (15 Hours)

Unsupervised learning and clustering – Mixture densities and identifiability – Maximum- likelihood estimates - Applications to normal mixtures - Unsupervised Bayesian learning - Data description and clustering.

References

- R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, Second edition, John Wiley, 2006
- Gonzalez R.C. & Thomson M.G., Syntactic Pattern Recognition - An Introduction, Addison Wesley.
- Fu K.S., Syntactic Pattern Recognition And Applications, Prentice Hall
- RajanShinghal, Pattern Recognition: Techniques and Applications, Oxford University Press, 2008.

Elective II: 1. Statistical Computing for Data Analytics (PCS3CBT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Understand big data business analytics
- Develop the skills to analyze complex statistical data coming from the various fields.
- Analyze very large data sets in the context of real-world problems and interpret results using data analytics.
- Understand the optimization and computational techniques for the solution of the real-life problems.

Module I (12 Hours)

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

Module II (15 Hours)

Sampling Techniques - Data classification, Tabulation, Frequency and Graphic representation - Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Quartiles, Deciles, Percentile - Measures of variation – Range, IQR, Quartile deviation, Mean deviation, standard deviation, coefficient variance, skewness, Moments & Kurtosis.

Module III (15 Hours)

Random variable, distributions, two-dimensional R.V, joint probability function, marginal density function. Random vectors - Some special probability distribution - Binomial, Poison, Geometric, uniform, exponential, normal, gamma and Erlang. Multivariate normal distribution - Sampling distribution – Estimation

- point, confidence - Test of significance, 1& 2 tailed test, uses of t-distribution, F-distribution, $\chi 2$ distribution.

Module IV (15 Hours)

Predictive modeling and Analysis - Regression Analysis, Multicollinearity , Correlation analysis, Rank correlation coefficient, Multiple correlation, Least square, Curve fitting and good ness of fit

Module V (15 Hours)

Forecasting Models for Time series: MA, SES, TS with trend, season - Design of Experiments, one way classification, two-way classification, ANOVA, Latin square, Factorial Design.

References

- Chris Eaton, Dirk Deroos, Tom Deutsch et al., "Understanding Big Data, McGraw Hill, 2012
- Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.
- Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Wiley, 2013.
- James R Evans, "Business Analytics- Methods, Models and Decisions", Pearson 2013
- R N Prasad, Seema Acharya, Fundamentals of Business Analytics, Wiley 2015

Elective II: 2. Data Analytics (PCS4CBT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Learn Data Analytics Platforms.
- Validate patterns and relationships in large data sets using statistical tools.
- Apply data mining methodologies.

Module I: (15 Hours)

Introduction to Data Analytics Platforms–Traits of Big data –Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re- Sampling - Statistical Inference - Prediction Error, Ethics in Big Data Analytics.

Module II: (15 Hours)

Data Analysis Regression Modeling - Multivariate Analysis - Bayesian Modeling – Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis -Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

Module III: (15 Hours)

Mining Data Streams

Introduction To Streams Concepts–Stream Data Model andArchitecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform (RTAP) Applications.

Module IV: (15 Hours)

Frequent Itemsets

Mining Frequent Itemsets - Market Based Model–Apriori Algorithm–Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream

Module V: (12 Hours)

Clustering Techniques–Hierarchical–K-Means–Clustering High DimensionalData – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non- Euclidean Space– Clustering for Streams and Parallelism.

References

- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
- Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
- Pete Warden, "Big Data Glossary", O'Reilly, 2011.
- Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

Elective II: 3. Advanced Python Programming (PCS4CBT0220)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Acquire programming skills in core Python.
- Acquire Object Oriented Skills in Python.
- Develop the skill of designing Graphical user Interfaces in Python.
- Develop the ability to write database applications in Python.

Module I: (15 Hours)

Python Object Oriented Programming-Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support.

Module II: (15 Hours)

Python Regular Expression-Powerful pattern matching and searching Power of pattern searching using regex in python Real time parsing of networking or system data using regex Password, email, url validation using regular expression Pattern finding programs using regular expression.

Module III: (12 Hours)

Python Exception Handling-Avoiding code break using exception handling, Safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling.

Module IV: (15 Hours)

Python Database Interaction -SQL Database connection using python, Creating and searching tables, Reading and storing config information on database, Programming using database connections.

Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

Module V: (15 Hours)

Python Multithreading-Understanding threads, Forking threads, Synchronizing the threads, Programming using multithreading.

Contacting User through Emails Using Python- installing smtp python module, Sending email, Reading from file and sending emails to all users addressing them directly for marketing

Python CGI Introduction -Writing python program for CGI applications, Creating menus and accessing files, Server client program

References

- Mark Summerfield, Programming in python 3, second edition.
- Clinton W Brownley, Foundations for Analytics with Python.

Elective III: 1. Applied Cryptography (PCS3CBT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Learn fundamentals of cryptography and its application to network security
- Understand Advanced Encryption Standard.
- Apply various public key cryptography techniques.
- Understand the various Security Applications.
- Implement digital signature techniques

Module I: (12 Hours)

Classical Encryption Techniques-Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography. Traditional Block Cipher Structure, The Data Encryption Standard, The Strength of DES, Block Cipher Design Principles.

Module II: (15 Hours)

Advanced Encryption Standard-AES Structure, AES Transformation Functions, AES Key Expansion, AES Implementation. Multiple Encryption and Triple DES. Principles of Pseudo-random Number Generation, Pseudorandom Number Generators, Stream Ciphers, RC4, True Random Number Generators

Module III: (15 Hours)

Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, Cryptographic Hash Functions, Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA).

Module IV: (15 Hours)

Message Authentication Codes, Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, MACs Based on Hash Functions: HMAC.

Module V: (15 Hours)

Key Management and Distribution, Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure, Digital Signatures- Digital Signatures.

References

- William Stallings, Cryptography and Network Security-Principles and Practice, Sixth Edition 2014.
- Bruice Schneier, Applied Cryptography, Second edition, Wiley publications, 2006

Elective III: 2. Ethical Hacking (PCS4CBT0120)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- To gain knowledge about Ethical hacking and penetration testing.
- To learn about various types of attacks, attackers and security threats and vulnerabilities present in the computer system.
- To examine how social engineering can be done by attacker to gain access of useful & sensitive information about the confidential data.
- To learn about cryptography, and basics of web application attacks.
- To gain knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking.

Module I: (12 Hours)

Ethics of Ethical Hacking, Ethical Hacking and the Legal System, Proper and Ethical Disclosure, Social Engineering Attacks, Physical Penetration Attacks, Insider Attacks.

Module II: (15 Hours)

Vulnerability Analysis- Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering, Client-Side Browser Exploits, From Vulnerability to Exploit.

Module III: (15 Hours)

Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks – Privacy attacks.

Module IV: (15 Hours)

TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming.

Module V: (15 Hours)

Basic Linux Exploits, Advanced Linux Exploits, Collecting Malware and Initial Analysis,

Hacking Malware

References

- Ankit Fadia" Ethical Hacking" 2nd Edition Macmillan India Ltd
- Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Gray Hat Hacking The Ethical Hacker's Handbook ,, Third Edition.

Elective III: 3. Soft Computing (PCS4CBT0220)

72 Hours 4 Credits

COURSE OUTCOMES

The students will be able to

- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
- Understand the fundamental theory and concepts of neural networks, Identify different neural network architectures and applications.
- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Reveal different applications of these models to solve engineering and other problems.

Module I (15 Hours)

Introduction: Neural networks, Artificial network, Advantages of networks, Application scope of neural networks, Fuzzy logic, genetic algorithm, Hybrid systems – classification soft computing. Artificial neural network, Fundamental concept, Artificial neural network, biological neural network, Brains Vs computer comparison between biological neuron and artificial neuron.

Module II (15 Hours)

Evolution of neural networks, Basic models of ANN, important terminologies of ANNS, Mc Culloch-Pitts neuron, Hebb network. Supervised learning network – perception networks, Adaline, multiple Adaptive linear neurons (Madaline), Functional link networks, tree neural networks, wavelet neural networks.

Module III (15 Hours)

Back propagation networks, radial basis function network, time delay neural network, Associative memory networks. Auto associative memory network, Hetero associative memory network BAM, Hop filed network, unsupervised

Learning networks, Fixed weight competitive nets, Kohonenself organising maps, Learning vector quantization.

Module IV (15 Hours)

Introduction to Fuzzy logic, classical relations and fuzzy relations, tolerance and equivalence relations, non-interactive fuzzy sets, membership functions, features of membership functions , fuzzification, methods of membership value assignments, defuzzification, lambda- cuts , defuzzification methods, fuzzy arithmetic and fuzzy measures, fuzzy integrals, fuzzy rule base and approximate reasoning, truth values and tables in fuzzy logic, fuzzy proposition, formation of rules, fuzzy reasoning, fuzzy inference systems, overview of fuzzy expert system.

Module V (12 Hours)

Genetic algorithm, Applications of GA, Biological background, Genetic algorithms Vs traditional algorithms, Basic terminologies in genetic algorithm, simple GA ,General GA, operators in GA ,Encoding, selection, crossover, mutation.

References

- S.N. Sivanandam S.N. Deepa, "Principles of soft computing " second edition, Wiley India Pvt. Ltd
- J.S.R Jang, C.T. son ,E. MIZUTANI "Neuro Fuzzy and soft computing" first edition, ,Pearson education
- S Rajasekaran, G. A.Vijayalakshmi "Neural networks, Fuzzy logic and genetic Algorithms : synthesis and application", second edition ,prentice Hall of India.