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CURRICULUM AND SYLLABI

REGULATIONS - 2016

(As approved by the 9th Academic Council)

M. Tech.

NETWORK SECURITY

B.S. Abdur Rahman Crescent Institute of Science & Technology

Deemed to be University u/s 3 of the UGC Act, 1956

REGULATIONS, CURRICULUM AND SYLLABI

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JULY 2016

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VISION AND MISSION OF THE ISTITUTION

VISION

B. S. Abdur Rahman Crescent Institute of Science and Technology aspires to be a leader in Education, Training and Research in Engineering, Science, Technology and Management and to play a vital role in the Socio-Economic progress of the Country.

MISSION

- To blossom into an internationally renowned Institution
- To empower the youth through quality education and to provide professional leadership
- To achieve excellence in all its endeavors to face global challenges
- To provide excellent teaching and research ambience
- To network with global institutions of Excellence, Business, Industry and Research Organizations
- To contribute to the knowledge base through Scientific enquiry, Applied research and Innovation

VISION AND MISSION OF THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION

The vision of the Department of Computer Science and engineering is to impart quality education, inculcate professionalism and enhance the problem solving skills of the students in the domain of Computer Science and Engineering with a focus to make them industry ready, involve in possible areas of research, to pursue and have continual professional growth.

MISSION

- To equip the students with strong fundamental concepts, analytical capability, programming and problem solving skills.
- To create an academic environment conducive for higher learning through faculty training, self learning, sound academic practices and research endeavors.
- To provide opportunities in order to promote organizational and leadership skills in students through various co-curricular and extra – curricular activities
- To make the students industry ready and to enhance their employability through training and internships.
- To improve department industry collaboration through interaction including participation in professional society activities, guest lecturers and industrial visit.

PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES

M.Tech. (Network Security)

PROGRAMME EDUCATIONAL OBJECTIVES:

- To provide advanced knowledge and skills required in the area of network security.
- To equip the graduates with required strategies and tools for design and development of secure network systems.
- To impart knowledge to analyze and propose new schemes for the protection system relevant to industry.
- To undertake research in network security.

PROGRAMME OUTCOMES:

On completion of the programme the graduates will

- Have knowledge in practices and procedures adopted for software development in security domains.
- Be able to apply tools and techniques for solving problems of network security relevant to the society.
- Be able to undertake need based research with a focus on industry related issues in network security.
- Work as a team exhibiting effective system administrative skills.

REGULATIONS – 2016
FOR
M. Tech. / MCA / M.Sc. DEGREE PROGRAMMES

PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires

i. **"Programme"** means a Post Graduate Degree Programme (M. Tech. / MCA / M.Sc.)

ii. **"Course"** means a theory or practical subject that is normally studied in a semester, like Applied Mathematics, Structural Dynamics, Computer Aided Design, etc.

iii. **"Institution"** means B.S. Abdur Rahman Crescent Institute of Science and Technology, Chennai, 600048.

iv. **"Dean (Academic Affairs)"** means Dean (Academic Affairs) of B.S. Abdur Rahman Crescent Institute of Science and Technology, who administers the academic matters.

v. **"Dean (P.G. Studies)"** means Dean (P.G. Studies) of B.S. Abdur Rahman Crescent Institute of Science and Technology, who administers all P.G Programmes of the Institution in coordination with Dean (Academic Affairs)

vi. **"Dean (Student Affairs)"** means Dean (Student Affairs) of B.S. Abdur Rahman Crescent Institute of Science and Technology, who looks after the welfare and discipline of the students.

vii. **"Controller of Examinations"** means the Controller of Examinations of B.S. Abdur Rahman Crescent Institute of Science and Technology, who is responsible for conduct of examinations and declaration of results.

PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

P.G. Programmes Offered

The various P.G. Programmes and their modes of study are as follows:

Degree	Mode of Study
M. Tech. /M.C.A. / M.Sc.	Full Time & Part Time – Day / Evening / Weekends

Modes of Study

Full-time

Students admitted under "Full-Time" shall be available in the Institution during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

A full time student, who has completed all non-project courses desiring to do the Project work in part-time mode for valid reasons, shall apply to the Dean (Academic Affairs) through the Head of the Department. Permission may be granted based on merits of the case. Such conversion is not permitted in the middle of a semester.

Part-time

In this mode of study, the students are required to attend classes for the courses in the time slots selected by them, during the daytime (or) evenings (or) weekends.

Admission Requirements

Students for admission to the first semester of the Master's Degree Programme shall be required to have passed the appropriate degree examination of this Institution as specified in the Table shown for eligible entry qualifications for admission to P.G. programmes or any other degree examination of any University or authority accepted by this Institution as equivalent thereto.

Eligibility conditions for admission such as class obtained, number of attempts in the qualifying examination and physical fitness will be as prescribed by this Institution from time to time.

All part-time students should satisfy other conditions regarding experience, sponsorship etc., which may be prescribed by this Institution from time to time.

Student eligible for admission to M.C.A under lateral entry scheme shall be required to have passed three year degree in B.Sc (Computer Science) /

B.C.A / B.Sc (Information Technology)

DURATION AND STRUCTURE OF THE P.G. PROGRAMME

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

Programme	Min. No. of Semesters	Max. No. of Semesters
M. Tech. (Full Time)	4	8
M. Tech. (Part Time)	6	12
M.C.A. (Full Time)	6	12
M.C.A. (Part Time)	9	18
M.C.A. (Full Time) – (Lateral Entry)	4	8
M.C.A. (Part Time) – (Lateral Entry)	6	12
M.Sc. (Full Time)	4	8
M. Sc. (Part Time)	6	12

The PG. programmes consist of the following components as prescribed in the respective curriculum

i. Core courses
ii. General Elective courses
iii. Professional Elective courses
iv. Project work / thesis / dissertation
v. Laboratory Courses
vi. Case studies
vii. Seminars
viii. Mini Project
ix. Industrial Internship

The curriculum and syllabi of all PG. programmes shall be approved by the Academic Council of this Institution.

The minimum number of credits to be earned for the successful completion of the programme shall be specified in the curriculum of the respective specialization of the P.G. programme.

Each academic semester shall normally comprise of 80 working days. Semester-end examinations will follow immediately after the last working day.

ELIGIBLE ENTRY QUALIFICATIONS FOR ADMISSION TO P.G. PROGRAMMES

Sl. No.	Name of the Department	P.G. Programmes offered	Qualifications for admission
01	Civil Engineering	M. Tech. (Structural Engineering)	B.E / B. Tech. (Civil Engineering) / (Structural Engineering)
		M. Tech. (Construction Engineering and Project Management)	
02	Mechanical Engineering	M. Tech. (Manufacturing Engineering)	B.E. / B. Tech. (Mechanical / Auto / Manufacturing / Production / Industrial / Mechatronics / Metallurgy / Aerospace /Aeronautical / Material Science / Marine Engineering)
		M. Tech. (CAD/CAM)	
03	Polymer Engineering	M. Tech. (Polymer Technology)	B. E. / B. Tech. Mechanical / Production /Polymer Science or Engg or Tech / Rubber Tech / M.Sc (Polymer Sc./ Chemistry Appl. Chemistry)
04	Electrical and Electronics Engineering	M. Tech. (Power Systems Engg)	B.E / B.Tech (EEE / ECE / E&I / I&C / Electronics / Instrumentation)
		M. Tech. (Power Electronics & Drives)	B.E / B.Tech (EEE / ECE / E&I / I&C / Electronics / Instrumentation)
05	Electronics and Communication Engineering	M. Tech. (Communication Systems)	B.E / B.Tech (EEE/ ECE / E&I / I&C / Electronics / Instrumentation)
		M. Tech. (VLSI and Embedded Systems)	B.E. / B. Tech. (ECE / Electronics / E&I / I&C / EEE)
06	ECE Department jointly with Physics Dept.	M. Tech. (Optoelectronics and Laser Technology)	B.E. / B. Tech. (ECE / EEE / Electronics / EIE / ICE) M.Sc (Physics / Materials Science / Electronics / Photonics)
07	Electronics and Instrumentation Engineering	M. Tech. (Electronics and Instrumentation Engineering)	B.E. / B. Tech. (EIE / ICE / Electronics / ECE / EEE)

Sl. No.	Name of the Department	P.G. Programmes offered	Qualifications for admission
08	Computer Science and Engineering	M. Tech. (Computer Science and Engineering)	B.E. / B. Tech. (CSE / IT / ECE / EEE / EIE / ICE / Electronics / MCA)
		M. Tech. (Software Engineering)	B.E. / B. Tech. (CSE / IT) MCA
		M. Tech. (Network Security)	B.E. / B. Tech. (CSE / IT / ECE / EEE / EIE / ICE / Electronics / MCA)
		M. Tech. (Computer Science and Engineering with specialization in Big Data Analytics)	B.E. / B. Tech. (CSE / IT / ECE / EEE / EIE / ICE / Electronics / MCA)
09	Information Technology	M. Tech. (Information Technology)	B.E / B. Tech. (IT / CSE / ECE / EEE / EIE / ICE / Electronics) MCA
		M. Tech. (Information Security & Digital Forensics)	B.E / B. Tech. (IT / CSE / ECE / EEE / EIE / ICE / Electronics) MCA
10	Computer Applications	M.C.A.	Bachelor Degree in any discipline with Mathematics as one of the subjects (or) Mathematics at +2 level
		M.C.A. – (Lateral Entry)	B.Sc Computer Science / B.Sc Information Technology / B.C.A
		M. Tech. (Systems Engineering and Operations Research)	BE / B. Tech. (Any Branch) or M.Sc., (Maths / Physics / Statistics / CS / IT / SE) or M.C.A.
		M. Tech. (Data & Storage Management	BE / B. Tech. (Any Branch) or M.Sc., (Maths / Physics / Statistics / CS / IT / SE) or M.C.A.
11	Mathematics	M.Sc. (Actuarial Science)	Any Degree with Mathematics / Statistics as one of the subjects of study.
		M.Sc. Mathematics	B.Sc. (Mathematics)
12	Physics	M.Sc.(Physics)	B.Sc.(Physics / Applied Science / Electronics / Electronics Science / Electronics & Instrumentation)
		M.Sc. (Material Science)	B.Sc.(Physics / Applied Science / Electronics / Electronics Science / Electronics &

Sl. No.	Name of the Department	P.G. Programmes offered	Qualifications for admission
			Instrumentation)
13	Chemistry	M.Sc.(Chemistry)	B.Sc (Chemistry / Applied Science)
14	Life Sciences	M.Sc. Molecular Biology & Biochemistry	B.Sc. in any branch of Life Sciences
		M.Sc. Genetics	B.Sc. in any branch of Life Sciences
		M.Sc. Biotechnology	B.Sc. in any branch of Life Sciences
		M.Sc. Microbiology	B.Sc. in any branch of Life Sciences
		M.Sc. Bioscience	B.Sc. in any branch of Life Sciences
		M. Tech. Biotechnology	B. Tech. (Biotechnology / Chemical Engineering) / M.Sc. in any branch of Life Sciences

The curriculum of PG programmes shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits specified below:

Programme	Minimum prescribed credits
M. Tech.	73
M.C.A.	120
M.Sc.	72

Credits will be assigned to the courses for all P.G. programmes as given below:

- One credit for one lecture period per week (or) 15 periods per semester
- One credit for one tutorial period per week
- One credit each for seminar/practical session/project of two or three periods per week
- One credit for two weeks of industrial internship
- One credit for 15 periods of lecture (can even be spread over a short span of time)

The number of credits registered by a student in non-project semester and project semester should be within the range specified below:

P.G. Programme	Full Time		Part Time	
	Non-project Semester	Project semester	Non-project Semester	Project semester
M. Tech.	9 to 28	12 to 28	6 to 12	12 to 28
M.C.A.	9 to 29	12 to 29	6 to 12	12 to 29
M.Sc.	9 to 25	12 to 20	6 to 12	12 to 20

The student may choose a course prescribed in the curriculum from any department depending on his / her convenient time slot. All attendance will be maintained course-wise only.

The electives from the curriculum are to be chosen with the approval of the Head of the Department.

A student may be permitted by the Head of the Department to choose electives from other PG programmes either within the Department or from other Departments up to a maximum of nine credits during the period of his/her study, with the approval of the Head of the Departments offering such courses.

To help the students to take up special research areas in their project work and to enable the department to introduce courses in latest/emerging areas in the curriculum, "Special Electives" may be offered. A student may be permitted to register for a "Special Elective" up to a maximum of three credits during the period of his/her study, provided the syllabus of this course is recommended by the Head of the Department and approved by the Chairman, Academic Council before the commencement of the semester, in which the special elective course is offered. Subsequently, such course shall be ratified by the Board of Studies and Academic Council.

The medium of instruction, examination, seminar and project/thesis/ dissertation reports will be English.

Industrial internship, if specified in the curriculum shall be of not less than two weeks duration and shall be organized by the Head of the Department.

Project Work / Thesis / Dissertation

Project work / Thesis / Dissertation shall be carried out under the supervision of a Faculty member in the concerned Department.

A student may however, in certain cases, be permitted to work for the project in an Industrial/Research Organization, on the recommendation of the Head of the Department. In such cases, the project work shall be jointly

supervised by a faculty of the Department and an Engineer / Scientist from the organization and the student shall be instructed to meet the faculty periodically and to attend the review committee meetings for evaluating the progress.

Project work / Thesis / Dissertation (Phase - II in the case of M. Tech.) shall be pursued for a minimum of 16 weeks during the final semester, following the preliminary work carried out in Phase-1 during the previous semester.

The Project Report/Thesis / Dissertation report / Drawings prepared according to approved guidelines and duly signed by the supervisor(s) and the Head of the Department shall be submitted to the concerned department.

The deadline for submission of final Project Report / Thesis / Dissertation is within 30 calendar days from the last working day of the semester in which Project / Thesis / Dissertation is done.

If a student fails to submit the Project Report / Thesis / Dissertation on or before the specified deadline he / she is deemed to have not completed the Project Work / Thesis / dissertation and shall re-register the same in a subsequent semester.

CLASS ADVISOR AND FACULTY ADVISOR

Class Advisor

A faculty member will be nominated by the HOD as Class Advisor for the whole class.

He / she is responsible for maintaining the academic, curricular and co-curricular records of all students throughout their period of study.

Faculty Advisor

To help the students in planning their courses of study and for general counseling on the academic programme, the Head of the Department of the students will attach a certain number of students to a faculty member of the department who shall function as Faculty Advisor for the students throughout their period of study. Such Faculty Advisor shall offer advice to the students on academic and personal matters and guide the students in taking up courses for registration and enrolment every semester.

CLASS COMMITTEE

Every class of the PG Programme will have a Class Committee constituted by the Head of the Department as follows:

i. Teachers of all courses of the programme

ii. One senior faculty preferably not offering courses for the class, as

Chairperson.

iii. Minimum two students of the class, nominated by the Head of the Department.

iv. Class Advisor / Faculty Advisor of the class - Ex-Officio Member

v. Professor in-charge of the PG Programme - Ex-Officio Member.

The Class Committee shall be constituted by the respective Head of the Department of the students.

The basic responsibilities of the Class Committee are to review periodically the progress of the classes to discuss problems concerning curriculum and syllabi and the conduct of classes. The type of assessment for the course will be decided by the teacher in consultation with the Class Committee and will be announced to the students at the beginning of the semester. Each Class Committee will communicate its recommendations to the Head of the Department and Dean (Academic Affairs). The class committee, **without the student members,** will also be responsible for finalization of the semester results and award of grades.

The Class Committee is required to meet at least thrice in a semester, first within a week of the commencement of the semester, second, after the first assessment and the third, after the semester-end examination to finalize the grades.

6.0 COURSE COMMITTEE

Each common theory course offered to more than one group of students shall have a “Course Committee” comprising all the teachers teaching the common course with one of them nominated as Course coordinator. The nomination of the Course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The Course Committee shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the Course Committee may also prepare a common question paper for the test(s).

REGISTRATION AND ENROLMENT

For the first semester every student has to register for the courses within one week from the commencement of the semester

For the subsequent semesters registration for the courses will be done by the student one week before the last working day of the previous semester.

The curriculum gives details of the core and elective courses, project and

seminar to be taken in different semester with the number of credits. The student should consult his/her Faculty Advisor for the choice of courses. The Registration form shall be filled in and signed by the student and the Faculty Advisor.

From the second semester onwards all students shall pay the prescribed fees and enroll on a specified day at the beginning of a semester.

A student will become eligible for enrolment only if he/she satisfies clause 9 and in addition he/she is not debarred from enrolment by a disciplinary action of the Institution. At the time of enrolment a student can drop a course registered earlier and also substitute it by another course for valid reasons with the consent of the Faculty Advisor. Late enrolment will be permitted on payment of a prescribed fine up to two weeks from the date of commencement of the semester.

Withdrawal from a course registered is permitted up to one week from the date of the completion of the first assessment test.

Change of a course within a period of 15 days from the commencement of the course, with the approval of Dean (Academic Affairs), on the recommendation of the HOD, is permitted.

Courses withdrawn will have to be taken when they are offered next if they belong to the list of core courses.

A student undergoing a full time PG Programme should have enrolled for all preceding semesters before registering for a particular semester

A student undergoing the P.G. programme in Part Time mode can choose not to register for any course in a particular semester with written approval from the head of the department. However the total duration for the completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 3.1)

TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

A student may be permitted by the Dean (Academic Affairs) to avail temporary break of study from the programme up to a maximum of two semesters for reasons of ill health or other valid grounds. Such student has to rejoin only in the same semester from where he left. However the total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 3.1).

MINIMUM REQUIREMENTS TO REGISTER FOR PROJECT / THESIS / DISSERTATION

A student is permitted to register for project semester, if he/she has earned the minimum number of credits specified below:

Programme	Minimum No. of credits to be earned to enroll for project semester
M. Tech. (Full time / Part time)	18
M.C.A. (Full time / Part time)	45
M.C.A. (Full time / Part time) – (Lateral Entry)	22
M.Sc.(Full time / Part time)	18

If the student has not earned minimum number of credits specified, he/she has to earn the required credits, at least to the extent of minimum credits specified in clause 9.1 and then register for the project semester.

DISCIPLINE

Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity, which will tend to bring down the prestige of the Institution.

Any act of indiscipline of a student reported to the Head of the Institution will be referred to a Discipline and Welfare Committee for taking appropriate action.

ATTENDANCE

Attendance rules for all Full Time Programme and Part time Programmes are given in the following sub-clause.

Ideally every student is expected to attend all classes and earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% for genuine reasons like on medical grounds, representing the Institution in approved events etc., to become eligible to appear for the semester-end examination in that course, failing which the student shall be awarded "I" grade in that course. If the course is a core course, the student should register for and repeat the course when it is offered next. If the course is an elective, either he/she can register and repeat the same elective or can register for a new elective.

The students of Full Time mode of study, who have not attended a single hour in all courses in a semester and awarded ‘I’ grade are not permitted to

write the examination and also not permitted move to next higher semester. Such students should repeat all the courses of the semester in the next Academic year.

SUMMER TERM COURSES

Summer term courses may be offered by a department on the recommendation of the Departmental Consultative Committee and approved by the Dean (Academic Affairs). No student should register for more than three courses during a summer term.

Summer term courses will be announced by the Head of the department at the end of the even semester before the commencement of the end semester examinations. A student will have to register within the time stipulated in the announcement. A student has to pay the fees as stipulated in the announcement.

The number of contact hours and the assessment procedure for any course during summer term will be the same as those during regular semesters. Students with U grades will have the option either to write semester end arrears exam or to redo the courses during summer / regular semesters, if they wish to improve their continuous assessment marks subject to the approval of the Head of the department.

Withdrawal from a summer term course is not permitted. No substitute examination will be conducted for the summer term courses.

The summer term courses are not applicable for the students of Part Time mode.

ASSESSMENTS AND EXAMINATIONS

The following rule shall apply to all the PG programmes (M. Tech. / M.C.A. / M.Sc.)

For lecture-based courses, normally a minimum of two assessments will be made during the semester. The assessments may be combination of tests and assignments. The assessment procedure as decided in the Class Committee will be announced to the students right from the beginning of the semester by the course teacher.

There shall be one examination of three hours duration, at the end of the semester.

In one (or) two credit courses that are not spread over the entire semester, the evaluation will be conducted at the completion of the course itself. Anyhow approval for the same is to be obtained from the HoD and the Dean of Academic Affairs.

The evaluation of the Project work will be based on the project report and a Viva-Voce Examination by a team consisting of the supervisor concerned, an Internal Examiner and External Examiner to be appointed by the Controller of Examinations.

At the end of industrial internship, the student shall submit a certificate from the organization and also a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a Departmental Committee constituted by the Head of the Department.

WEIGHTAGES

The following shall be the weightages for different courses:

i) Lecture based course

Two continuous assessments	50%
Semester-end examination	50%

ii) Laboratory based courses

Laboratory work assessment	75%
Semester-end examination	25%

iii) Project work

Periodic reviews	50%
Evaluation of Project Report by External Examiner	20%
Viva-Voce Examination	30%

Appearing for semester end examination for each course (Theory and Practical) is mandatory and a student should secure a minimum of 40% marks in semester end examination for the successful completion of the course.

The markings for all tests, tutorial, assignments (if any), laboratory work and examinations will be on absolute basis. The final percentage of marks is calculated in each course as per the weightages given in clause 13.1.

SUBSTITUTE EXAMINATION

A student who has missed for genuine reasons any one of the three assessments including semester-end examination of a course may be permitted to write a substitute examination. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accident or admissions to a hospital due to illness, etc.

A student who misses any assessment in a course shall apply in a prescribed form to the Dean (Academic Affairs) through the Head of the department within a week from the date of missed assessment. However

the substitute tests and examination for a course will be conducted within two weeks after the last day of the semester-end examinations.

COURSEWISE GRADING OF STUDENTS AND LETTER GRADES

Based on the semester performance, each student is awarded a final letter grade at the end of the semester in each course. The letter grades and the corresponding grade points are as follows, but grading has to be relative grading

Letter grade	Grade points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
W	-
I	-
AB	-

- Flexible range grading system will be adopted
- **“W”** denotes withdrawal from the course.
- **"I"** denotes inadequate attendance and hence prevention from semester-end examination
- **"U"** denotes unsuccessful performance in a course.
- **“AB”** denotes absent for the semester end examination

A student is considered to have completed a course successfully if he / she secure five grade points or higher. A letter grade ‘U’ in any course implies unsuccessful performance in that course.

A course successfully completed cannot be repeated for any reason.

AWARD OF LETTER GRADE

A final meeting of the Class Committee without the student member(s) will be convened within ten days after the last day of the semester end examination. The letter grades to be awarded to the students for different courses will be finalized at the meeting.

After finalization of the grades at the class committee meeting the Chairman will forward the results to the Controller of Examinations, with copies to Head of the Department and Dean (Academic Affairs).

DECLARATION OF RESULTS

After finalization by the Class Committee as per clause 16.1 the Letter grades awarded to the students in the each course shall be announced on the departmental notice board after duly approved by the Controller of Examinations.

In case any student feels aggrieved about the results, he/she can apply for revaluation after paying the prescribed fee for the purpose, within one week from the announcement of results.

A committee will be constituted by the concerned Head of the Department comprising of the Chairperson of the concerned Class Committee (Convener), the teacher concerned and a teacher of the department who is knowledgeable in the concerned course. If the Committee finds that the case is genuine, it may jointly revalue the answer script and forward the revised marks to the Controller of Examinations with full justification for the revision, if any.

The “U” and “AB” grade once awarded stays in the grade sheet of the students and is not deleted when he/she completes the course successfully later. The grade acquired by the student later will be indicated in the grade sheet of the appropriate semester.

COURSE REPETITION AND ARREARS EXAMINATION

A student should register to re-do a core course wherein "I" or "W" grade is awarded. If the student is awarded "I" or "W" grade in an elective course either the same elective course may be repeated or a new elective course may be taken.

A student who is awarded “U” or “AB” grade in a course shall write the semester-end examination as arrear examination, at the end of the next semester, along with the regular examinations of next semester courses.

A student who is awarded “U” or “AB” grade in a course will have the option of either to write semester end arrear examination at the end of the subsequent semesters, or to redo the course whenever the course is offered. Marks earned during the redo period in the continuous assessment for the course, will be used for grading along with the marks earned in the end-semester (re-do) examination.

If any student obtained “U” or “AB” grade, the marks earned during the redo period for the continuous assessment for that course will be considered for further appearance as arrears.

If a student with “U” or “AB” grade prefers to redo any particular course fails to earn the minimum 75% attendance while doing that course, then he/she will not be permitted to write the semester end examination and his / her earlier ‘U’ grade and continuous assessment marks shall continue.

GRADE SHEET

The grade sheet issued at the end of the semester to each student will contain the following:

(i) the credits for each course registered for that semester.

(ii) the performance in each course by the letter grade obtained.

(iii) the total credits earned in that semester.

(iv) the Grade Point Average (GPA) of all the courses registered for that semester and the Cumulative Grade Point Average (CGPA) of all the courses taken up to that semester.

The GPA will be calculated according to the formula

$$GPA = \frac{\sum_{i=1}^{n} (C_i)(GP_i)}{\sum_{i=1}^{n} (C_i)}$$

where n = number of courses

where C_i is the number of credits assigned for i^{th} course

GP_i - Grade point obtained in the i^{th} course

for the cumulative grade point average (CGPA) a similar formula is used except that the sum is over all the courses taken in all the semesters completed up to the point of time.

‘I’ and ‘W’ grades will be excluded for GPA calculations.

‘U’, ‘AB’ ‘I’ and ‘W’ grades will be excluded for CGPA calculations.

Classification of the award of degree will be as follows:

For students under full time mode of study

CGPA	Classification
8.50 and above, having completed all courses in first appearance	First class with Distinction
6.50 and above, having completed within a period of 2 semesters beyond the programme period	First Class
All others	Second Class

However, to be eligible for First Class with Distinction, a student should not have obtained U or I grade in any course during his/her study and should have completed the PG Programme within a minimum period covered by the minimum duration (clause 3.1) plus authorized break of study, if any (clause 8). To be eligible for First Class, a student should have passed the examination in all courses within the specified minimum number of semesters reckoned from his/her commencement of study plus two semesters. For this purpose, the authorized break of study will not be counted. The students who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to two decimal places. For the purpose of comparison of performance of students and ranking, CGPA will be considered up to three decimal places.

For students under part time mode of study

CGPA	Classification
8.50 and above, having completed all courses in first appearance	First class with Distinction
6.50 and above	First Class
All others	Second Class

For the purpose of classification, the CGPA will be rounded to two decimal places.

ELIGIBILITY FOR THE AWARD OF THE MASTERS DEGREE

A student shall be declared to be eligible for the award of the Masters Degree, if he/she has:

i) successfully acquired the required credits as specified in the Curriculum corresponding to his/her programme within the stipulated time,
ii) no disciplinary action is pending against him/her.

The award of the degree must be approved by the Institution.

POWER TO MODIFY

Notwithstanding all that have been stated above, the Academic Council has the right to modify any of the above regulations from time to time.

CURRICULUM & SYLLABI FOR

M. Tech. (Network Security)

Curriculum

Sl. No.	Course Code	Course Title	L	T	P	C
		SEMESTER I				
1	MAC6183	Probability and Statistics	**3**	**1**	**0**	**4**
2	CSC6103	Computer Networks and Management	**2**	**0**	**2**	**3**
3	CSC6141	Security Frameworks	**3**	**0**	**0**	**3**
4	CSC6142	Computer Security	**3**	**0**	**2**	**4**
5	CSC6143	Social Media Security	**3**	**0**	**0**	**3**
6	CSC6144	Information Assurance and Security	**3**	**0**	**2**	**4**
7	CSC6145	Case Study 1	**0**	**0**	**2**	**1**
						22
		SEMESTER II				
1	ECC6203	Research Methodology For Electronics Engineers	**3**	**1**	**0**	**4**
2	CSC6241	Hacking Techniques and Digital Forensics	**3**	**0**	**2**	**4**
3	CSC6242	Secure Software Systems	**3**	**0**	**2**	**4**
4		Professional Electives #				**9**
5	CSC6243	Case Study 2/ Term paper	**0**	**0**	**2**	**1**
						22
		SEMESTER III				
1		Professional Electives ##				**9**
2		General Elective	**3**	**0**	**0**	**3**
3	CSC7141	Project – Phase I	**0**	**0**	**12**	**6**
						12

Sl. No.	Course Code	Course Title	L	T	P	C
		SEMESTER IV				
1	CSC7141	Project – Phase II	**0**	**0**	**36**	**18**
						6+18=24
		Total				**80**

- Student has to take a minimum of 9 credits from the list of Electives.

- Student has to take a minimum of 9 credits from the list of Electives.

PROFESSIONAL ELECTIVES

Sl. No.	Course code	Course Title	L	T	P	C
		LIST OF ODD SEMESTER ELECTIVES				
1.	CSCY126	High Performance computing	**3**	**0**	**0**	**3**
2.	CSCY141	Database Security	**1**	**0**	**2**	**2**
3.	CSCY142	Advanced Digital Forensics	**3**	**0**	**0**	**3**
4.	CSCY143	Security in Smart Devices	**3**	**0**	**0**	**3**
5.	CSCY144	Security Issues in Cloud Computing	**3**	**0**	**0**	**3**
6.	CSCY145	Public Key Infrastructure and Key Management	**3**	**0**	**0**	**3**
7.	CSCY146	Service Oriented Architecture	**3**	**0**	**0**	**3**
8.	CSCY147	Technical Foundation of E-Commerce	**3**	**0**	**0**	**3**
9.	MAC6194	Operations Research	**3**	**0**	**0**	**3**
		LIST OF EVEN SEMESTER ELECTIVES				
1.	CSCY202	Mobile Adhoc Networks	**3**	**0**	**0**	**3**
2.	CSCY207	Software Project Management	**3**	**0**	**0**	**3**
3.	CSCY241	Intrusion Detection	**2**	**0**	**2**	**3**
4.	CSCY242	Game Theory and its Applications	**1**	**0**	**2**	**2**
5.	CSCY243	Mobile and Wireless Network Security	**2**	**0**	**2**	**3**
6.	CSCY244	Biometric Security	**1**	**0**	**2**	**2**
7.	CSCY245	Advanced Algorithms	**3**	**0**	**0**	**3**
8.	CSCY246	Human Aspects of Computer Security	**3**	**0**	**0**	**3**
9.	ITC6201	Cloud Computing Technologies	**3**	**0**	**0**	**3**

LST OF SINGLE CREDIT ELECTIVE COURSES

Sl. No.	Course code	Course Title	L	T	P	C
1.	CSCY071	Wireless Network Programming	**0.5**	**0**	**1**	**1**
2.	CSCY072	Cloud Computing Programming	**0.5**	**0**	**1**	**1**
3.	CSCY073	Big Data Programming	**0.5**	**0**	**1**	**1**
4.	CSCY074	Visual Systems Programming	**0.5**	**0**	**1**	**1**
5.	CSCY075	Open Source Tools	**0.5**	**0**	**1**	**1**

GENERAL ELECTIVES FOR M.TECH PROGRAMMES

Sl. No.	Course Code	Course Title	L	T	P	C
1	GECY101	Project Management	**3**	**0**	**0**	**3**
2	GECY102	Society, Technology & Sustainability	**3**	**0**	**0**	**3**
3	GECY103	Artificial Intelligence	**3**	**0**	**0**	**3**
4	GECY104	Green Computing	**3**	**0**	**0**	**3**
5	GECY105	Gaming Design	**3**	**0**	**0**	**3**
6	GECY106	Social Computing	**3**	**0**	**0**	**3**
7	GECY107	Soft Computing	**3**	**0**	**0**	**3**
8	GECY108	Embedded System Programming	**3**	**0**	**0**	**3**
9	GECY109	Principles of Sustainable Development	**3**	**0**	**0**	**3**
10	GECY110	Quantitative Techniques in Management	**3**	**0**	**0**	**3**
11	GECY111	Programming using MATLAB & SIMULINK	**1**	**0**	**2**	**2**
12	GECY112	JAVA Programming	**1**	**0**	**2**	**2**
13	GECY113	PYTHON Programming	**1**	**0**	**2**	**2**
14	GECY114	Intellectual Property Rights	**1**	**0**	**0**	**1**

SEMESTER I

MAC6183 PROBABILITY AND STATISTICS

L	T	P	C
3	1	0	4

OBJECTIVES :

- a comprehensive introduction to the probability distributions.
- familiarize with testing of hypothesis and estimation theory.
- basic knowledge in simulations used in engineering.

MODULE I PROBABILITY DISTRIBUTIONS 10 + 03

Axioms of probability – addition and multiplication theorem – conditional probability – total Probability – random variables- moments – moments generating functions and their properties- Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

MODULE II TWO DIMENSIONAL RANDOM VARIABLES 09 + 03

Joint distributions - Marginal and conditional distributions – functions of random variables - Covariance - Correlation and regression - Central limit theorem.

MODULE III ESTIMATION THEORY 09 + 03

Partial, Multiple correlations and regressions – Estimation of parameters using maximum likelihood estimator and method of moments.

MODULE IV TESTING OF HYPOTHESIS 08 + 03

Hypothesis, test statistic, decisions and errors - classical testing, significance and p-values – Student's t- test , Fisher's test and Chi-square tests

MODULE V SIMULATION 09 + 03

Simulation - definition - Monte Carlo simulation - random number generation, simulation model building - validation - run size determination - simulation applications - inventory control - facilities creation, simulation software.

L – 45 ; T – 15

TEXT BOOKS :

1. Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers", 4th Edition, Wiley publication, 2006.

2. Richard A. Johnson, “Miller and Freund’s Probability and Statistics for Engineers”, 8th Edition, PHI, 2011.
3. Sheldon M. Ross, “Introduction to probability models”, 10th edition, Academic Press, 2009.

REFERENCES :

1. Jerry Banks, John S. Carson, Barry L. Nelson, “Discrete – Event systems Simulation”, Prentice Hall India, New Delhi, 1999.
2. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences”, Duxbury publication, 2007.
3. R. Lyman Ott, Michael Longnecker, “An Introduction to Statistical Methods and Data Analysis”, 6th edition, Brooks/Cole Cengage Learning, USA, 2010.

OUTCOMES :

Students who complete this course will be able to

- identify and fit probability distribution for a given data.
- solve two dimensional random variable problem.
- solve estimation theory problem.
- testing the hypothesis.
- solve problems in modeling using simulation techniques.

CSC6103 COMPUTER NETWORKS AND MANAGEMENT

L	T	P	C
2	0	2	3

OBJECTIVES :

- To outline the basic concepts of computer networks
- To illustrate the operations of network traffic, congestion, controlling and Queuing delay models
- To compare different mechanism for quality of service and Internet protocols
- To describe the concept and architecture of network management
- To showcase the different network management protocols like SNMP and RMON
- To identify various network tools to simulate the working of connection oriented and connectionless networks.

MODULE I INTRODUCTION TO COMPUTER NETWORKS 09

Introduction – Reliable Transmission via Redundancy – Reliable transmission by retransmission - Routing and addressing – Link Layer Protocols and Technologies – Quality of Service overview.

MODULE II TRANSMISSION CONTROL PROTOCOL (TCP) AND SWITCHING AND QUEUING DELAY MODELS 09

Introduction to UDP and TCP – User Datagram Protocol (UDP) – TCP and Reliable Byte Stream Service – Congestion Control – Fairness – Recent TCP Versions – TCP Wireless Links - Packet Switching in Routers - Queuing Model – Networks of Queues.

MODULE III MECHANISMS FOR QUALITY OF SERVICE AND INTERNET PROTOCOLS 09

Queue Scheduling – Policing – Active Queue Management – MPLS - Internet Protocol Version (IPV6) – Routing Protocols – Address Translation Protocols – Domain Name System (DNS) – Network Management Protocols – Network Tools.

MODULE IV NETWORK MANAGEMENT AND SNMP 09

Network Management : goals , Organization and Functions – Network Management Architecture and organization – Network Management perspective– NMS platform – Current Status & future of Network Management – SNMP V1 Network Management- Basic Foundation standards, Models and languages – Organization and information Models - Communication and functional Models – SNMP V2 – SNPV3.

MODULE V RMON, NETWORK MANAGEMENT TOOLS AND APPLICATIONS 09

Remote Monitoring – RMON SMI & MIB –RMON1-RMON2-ATM Remote Monitoring – A Case Study of Internet Traffic using RMON – Network Management Tools, Systems and Engineering –System utilities for Management – Network Statistics Measurement Systems – MIB Engineering – NMS Design – Network Management Applications.

L – 30;P 30

REFERENCES :

1. Ivan Marsic , “Computer Networks Performance and Quality of Service” , Rutgers University, New Brunswick, New Jersey, 1st edition, FREE PDF, ISBN-10: N/A, http://www.ece.rutgers.edu/~marsic/books/CN, 2013.
2. Mani Subramanian “Network Management : Principles and Practice “,2nd edition, Pearson Edition, ISBN-13: 978-8131734049, 2010.
3. Olivier Bonaventure, “Computer Networking : Principles, Protocols and Practice”, Creative Commons Attribution , ISBN: 978-1-365-18583-0, 2011.
4. Larry Peterson and Bruce S Davis “Computer Networks :A System Approach” 5th Edition, Elsevier , ISBN-13: 978-0123850591, 2014.
5. Douglas E Comer, “Internetworking with TCP/IP, Principles, Protocols and Architecture” 6th Edition, PHI, ISBN-13: 978-0136085300, 2014.

OUTCOMES :

Students who complete this course will be able to

- Describe the network services, protocols and architectures
- Identify the different congestion control techniques
- Develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery, etc.
- Apply SNMP and RMON for Managing Network.
- Access MIBS from devices using SNMP on a workstation
- Analyze and interpret the data provided by an NMS and take suitable actions.

CSC6141 SECURITY FRAMEWORKS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To study the basic concepts of network security, SDLC and security policies.
- To know the requirement for IPv6 and addressing mechanism using IPv6.
- To learn the fundamentals of Access Control List (ACL), firewalls and network address translation.
- To find the difference between IDS and IPS, various technologies used for IPS.
- To study how to use the network, role of attacker and defender, offensive and defensive strategies, tools for attacking the network.
- To illustrate the various frameworks for security.

MODULE I NETWORK SECURITY CONCEPTSS AND POLICIES 07

Building blocks of information security – Evaluating and managing the risk – Security policies – Secure network lifecycle management.

MODULE II SECURING THE DATA PLANE IN IPv6, THREAT CONTROL & MITIGATION 08

Need for IPv6 – features and enhancements – IPv6 addressing – Threat control strategies – fundamentals of ACL for threat mitigation – firewall fundamentals and network address translation.

MODULE III I DS & IPS 10

Introduction to IDS and IPS – IPS Technologies : signature based, policy based, anomaly based, reputation based – IPS attack responses, IPS anti evasion techniques, risk based intrusion prevention.

MODULE IV NETWORK ATTACKS AND EXPLOITATION 10

Computer network exploitation – Attacker – Defender – Asymmetries – offensive and defensive strategy – attack tools.

MODULE V FRAMEWORKS 10

Introduction – IPSec Framework – COBIT, ISO 27000, NIST SP 800 series.

Theory 45

REFERENCES :

1. Catherine Paquet, Implementing Cisco IOS Network Security (IINS 640-554) Foundation Learning Guide, 2nd Edition, 2012, Cisco Press.
2. William Stallings, Cryptography And Network Security Principles And Practice, 2016, Seventh Edition, Pearson Education, Prentice Hall.
3. Matthew Monte, Network Attacks and Exploitation: A Framework, First edition, Wiley publications, 2015.

OUTCOMES :

Students who complete this course will be able to

- Explain about secure network life cycle management.
- Use IPv6 address translation
- Define the use of firewalls and network address translation,
- Use IPS technologies.
- Demonstrate how to exploit the network using the tools available.
- Differentiate the frameworks available for network security.

CSC6142 COMPUTER SECURITY

L	T	P	C
3	0	2	4

OBJECTIVES :

The Student should

- identify concepts and ethics in Computer Security.
- demonstrate a breadth of knowledge in the topics of Computer Security, and understand its relevance and potential for an ever increasing number of applications.
- design and implement computer security systems and related protocols in different settings.
- possess the fundamental methodology for how to design and analyze security critical systems.
- discover and identify abnormalities caused by worms, viruses and network security related threats.
- probe into malware at the code level to understand how to write resilient apps.

MODULE I FOUNDATION AND ACCESS CONTROL 08

Definitions-Principles-Security Management-Risk and Threat Analysis- Security Policies- Identification – Authentication –Authorization-Access operations- Access control structures-Computer Security Strategy-Security Functional Requirements.

MODULE II CRYPTOGRAPHY AND MUTUAL TRUST 10

Principles-Concepts –Symmetric and Asymmetric Encryption–AES – Block Cipher Operations– RSA Algorithm – Diffie Hellman Key Exchange -Hash Functions– Message Authentication Codes – Digital Signatures- Key Management and Distribution.

MODULE III IT SECURITY MANAGEMENT AND RISK ASSESSMENT 09

IT Security Management- Organizational Context and Security Policy- Security Risk Assessment- Detailed Security Risk Analysis- Implementation- Security Controls or Safeguards- IT Security Plan- Implementation of Controls- Monitoring Risks.

MODULE IV MALICIOUS SOFTWARE 09

Types of Malicious Software- Advanced Persistent Threat- Propagation – Infected Content – viruses- Propagation – Vulnerability Exploit – Worms-Social Engineering – SPAM E-Mail-Trojans-Payload – System Corruption-Attack Agent–

Zombie, Bots-Information Theft – Keyloggers, Phishing, Spyware-Stealthing – Backdoors, Rootkits-Countermeasures.

MODULE V SECURITY AUDITING, LEGAL AND ETHICAL ASPECTS 09

Security Auditing Architecture-The Security Audit Trail- Implementing the Logging Function-Audit Trail Analysis Cybercrime and Computer Crime-Intellectual Property- Privacy-Ethical Issues.

L-45; P-30

REFERENCES :

1. Dieter Gollman, “Computer Security”, 3rd Edition, John Wiley Publishers, ISBN No. 978-0470741153, 2014.
2. William Stallings & Lawrie Brown, “Computer Security Fundamentals & Practice”, 3rd Edition, Pearson Education, ISBN No 9781292066172, 2014.
3. Seymour Bosworth, M.E.Kabay, Eric Whyne, “Computer Security Handbook” 6th Edition, John Wiley Publishers, ISBN No 978-1118127063, 2014.
4. Joseph Migga Kizza, “Guide to Computer Network Security” 3rd Edition, Springer Publishers, ISBN No.978-1447166535, 2015.
5. Chuck Easttom, “Computer Security Fundamentals”, 2nd Edition, Pearson Education, ISBN No.978-0132828321, 2014.

OUTCOMES :

Students who complete this course will be able to

- internalize the fundamental notions of threat, vulnerability, attack and countermeasure.
- communicate clearly and effectively ideas, concepts and intentions within the field of computer security.
- apply sound principles to designing secure systems and to discovering vulnerabilities in existing systems
- give an individual presentation to audience of peers within the discipline of computer security.
- categorize security threats, and the security services and mechanisms to counter them.
- assess and critique references to security auditing.

CSC6143 SOCIAL MEDIA SECURITY

L	T	P	C
3	0	0	3

- To provide basic concepts of social media and expose to current trends and opportunities
- To recognize the sources of risks posed in social media
- To discuss various forms of cyber crimes and related impact on social media
- To identify sources of risks and assess their exploitation on the media
- To make aware of the policies and principles for enforcing security
- To impart various security mechanisms designed for social media

MODULE I SOCIAL MEDIA AND ITS OPPORTUNITIES 09

Social media – Types and classifications - Values of social media – Issues with social media – opportunities of social media – Building social authority – Sharing information – Considerations for setting up social media – Human factor – Content management – promotion of social media.

MODULE II RISKS IN SOCIAL MEDIA 09

Sources of risk – Content removal from social media – False information – Information leakage – backing up social media – risk due to loss of data and equipment – Cybercrime – Cyber stalking - Cyber bullying – Predators – Phishing – Fake sites – Hacked accounts.

MODULE III RISK MANAGEMENT 09

Assessing risks – Sources of risks – Laws and Regulations – Forensics – Police use of Social media – Malware - Viruses and exploit distribution.

MODULE IV POLICIES AND PRIVACY 09

Policy creation and enforcement – policies affected by social media – Privacy – Privacy restrictions on facebook – Protecting tweets – Blocking users – controlling app privacy – Location awareness and social media – Hiding events – Privacy of photos.

MODULE V SECURITY ON SOCIAL MEDIA 09

Tracking accounts – Security strategies – Fake account management – Password management – Privacy and information sharing – Content security - Case study on current trends related to social media security.

Theory 45

REFERENCES :

1. Michael Cross, “Social Media Security: Leveraging Social Networking While Mitigating Risk”, Elsvier Syngress Publisher, ISBN-10: 1597499862, 2014.
2. Barbara Carminati, Elena Ferrari, Marco Viviani, “Security and Trust in Online Social Networks: Synthesis Lectures on Information Security, Privacy and Trust”, Morgan and Claypool Publishers, 2013.
3. Gary Bahadur, Alex de Carvalho, Jason Inasi, “Securing the Clicks Network Security in the Age if Social Media”, McGraw Hill Education Publishers, ISBN-10: 1259027457, 2012.
4. Christopher Hadnagy, “Social Engineering: The art of Human Hacking”, Wiley Publishing Inc., ISBN: 978-0-470-63953-5, 2010.

OUTCOMES :

Students who complete this course will be able to

- Relate the activities on the social media and their impact on information sharing
- Practically identify information flow and the risks prevalent on day-to-day activities on the social media
- Categorize various forms of cyber crimes related to social media
- Critique upon the sources of risks and relate their effect on the security of social media
- Review the policies and principles practiced by the government in enforcing security in the social media
- Analyse a given scenario and propose suitable security mechanisms to enforce secure social media operations

CSC6144 INFORMATION ASSURANCE AND SECURITY

L	T	P	C
3	0	2	4

OBJECTIVES :

- To give an overview of Information Security terms and terminologies.
- To study the different approaches for information planning process.
- To formulate the prevention process for Information Security
- To expose to different monitoring tools for Information Security Detection process
- To examine the various security recovery techniques
- To brief upon real time practices in providing Information assurances and security

MODULE I INTRODUCTION TO INFORMATION SECURITY 09

Need for Security - Basic concepts - Assets, Threats, Vulnerabilities, Risks, and Controls - Security Professionals and Organizations – Security Management System - Implementing Information Security Strategy into Current Practices, Regulations, and Plans.

MODULE II INFORMATION SECURITY PLANNING PROCESS 09

Approaches to Implementing Information Security - Organizational Structure for Managing Information Security - Asset Management - Information Security Risk Management & Security Policies - Human Resource Security - Certification, Accreditation, and Assurance.

MODULE III INFORMATION SECURITY PREVENTION PROCESS 09

Information Security in System Development - Physical and Environmental Security Controls - Information Security Awareness, Training, and Education - Preventive Tools and Techniques - Access Control.

MODULE IV INFORMATION SECURITY DETECTION PROCESS 09

Monitoring Tools and Methods - Information Security Measurements – Metrics

MODULE V INFORMATION SECURITY RECOVERY PROCESS 09

Information Security Incident Handling - Computer Forensics - Business Continuity - Backup and Restoration – Current trends and practices.

L-45; P-30

REFERENCES :

1. Corey Schou, Steven Hernandez, “Information Assurance Handbook: Effective Computer Security and Risk Management Strategies”, McGraw Hill Education, First edition, ISBN: 9789339222376, 2015.
2. John A. Blackley, Thomas R. Peltier, Justin Peltier, “Information Security Fundamentals”, Auerbach Publications, ISBN: 9789339222376, 2004.
3. Corey Schou and Steven Hernandez, “Information Assurance for the Enterprise: A Roadmap to Information Security”, McGraw-Hill Publications, ISBN: 0072255242, 2006.

OUTCOMES :

Students who complete this course will be able to

- Relate the terms and terminologies of Information Security
- Recognize the approaches of security planning process and security policies
- Analyze and recommend security prevention tools and techniques
- Compare the tools and metrics for information security detection process and enumerate them
- Appraise the Information security process and suggest backup and restoration techniques
- Investigate a real time scenario and recommend suitable information assurance and security strategies

SEMESTER II

		L	T	P	C
ECC6203	**RESEARCH METHODOLOGY FOR ELECTRONICS ENGINEERS**	**3**	**1**	**0**	**4**

OBJECTIVES :

- To provide a perspective on research to the scholars
- To educate on the research conceptions for designing the research
- To be trained about research, design, information retrieval, problem formulation
- To impart knowledge on statistical techniques for hypothesis construction
- To gain knowledge on methods of data analysis and interpretation
- To learn about the effective communication of research finding and writing of research reports, papers and ethics in research.

MODULE I RESEARCH PROBLEM FORMULATION 09

Research – objectives – types, Research process, Solving engineering problems, Identification of research topic, Formulation of research problem, Literature survey and review.

MODULE II RESEARCH DESIGN 10

Research design – meaning and need – basic concepts, Different research designs, Experimental design – principle – important experimental designs, Design of experimental setup, Mathematical modeling, Simulation – validation and experimentation, Dimensional analysis and similitude.

MODULE III USE OF STATISTICAL TOOLS IN RESEARCH 12

Importance of statistics in research - Concept of probability - Popular distributions - Sample design. Hypothesis testing, ANOVA, Design of experiments - Factorial designs - Orthogonal arrays.

MODULE IV DATA COLLECTION, ANALYSIS AND INTERPRETATION OF DATA 10

Sources of Data, Use of Internet in Research, Types of Data - Research Data Processing and analysis - Interpretation of results- Correlation with scientific facts - repeatability and reproducibility of results - Accuracy and precision –limitations, Application of Computer in Research- Spreadsheet tool, Presentation tool-Basic principles of Statistical Computation.

MODULE V: OPTIMIZATIONTECHNIQUES 10

Use of optimization techniques - Traditional methods – Evolutionary Optimization Techniques. Multivariate analysis Techniques, Classifications, Characteristics, Applications -correlation and regression, Curve fitting

MODULE VI THE RESEARCH REPORT 09

Purpose of written report – audience, synopsis writing, preparing papers for International journals, Software for paper formatting like LaTeX/MS Office, Reference Management Software, Software for detection of Plagiarism –Thesis writing – Organization of contents – style of writing – graphs and charts – referencing, Oral presentation and defence, Ethics in research, Patenting, Intellectual Property Rights.

Total : 60

REFERENCES :

1. Ganesan R., Research Methodology for Engineers, MJP Publishers, Chennai, 2011.
2. Ernest O., Doebelin, Engineering Experimentation: planning, execution, reporting, McGraw Hill International edition, 1995.
3. George E. Dieter., Engineering Design, McGraw Hill – International edition, 2000.
4. Madhav S. Phadke, Quality Engineering using Robust Design, Printice Hall, Englewood Cliffs, New Jersey, 1989.
5. Kothari C.R., Research Methodology – Methods and Techniques, NewAge International (P) Ltd, New Delhi, 2003.
6. Kalyanmoy Deb., “Genetic Algorithms for optimization”, KanGAL report, No.2001002.
7. Holeman, J.P., Experimental methods for Engineers, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2007.
8. Govt. of India, Intellectual Property Laws; Acts, Rules & Regulations, Universal Law Publishing Co. Pvt. Ltd., New Delhi 2010.
9. University of New South Wales, “How to write a Ph.D. Thesis” Sydney, Australia, Science @ Unsw.
10. Shannon. R.E., System Simulation: the art and science, Printice Hall Inc, Englewood Cliffs, N.J.1995.
11. Scheffer. R.L. and James T. Mc Clave, Probability and Statistics for Engineers, PWS – Kent Publishers Co., Boston, USA, 1990.

OUTCOMES :

The graduates will have the capability to:

- Formulate the research problem
- Design and Analyse the research methodology
- Apply statistical techniques for hypothesis construction
- Construct and optimize the research hypothesis
- Analyse and interpret the data
- Report the research findings

CSC6241	HACKING TECHNIQUES AND DIGITAL FORENSICS	L	T	P	C
		3	0	2	4

OBJECTIVES :

- To learn about security attacks and tools available to curtail them.
- To expose the students to apply certain security threats
- Realize the different vulnerabilities and modes of preventing them
- To classify the different hacking methodologies
- To give an impression of various intrusions
- To know the legal, ethical and professional issues in digital forensics

MODULE I APPLICATION SECURITY 08

Evolution of Web Applications - Web Application Security - Problem Factors - Handling User Input - Web application technologies - New Security Perimeter.

MODULE II AUTHENTICATION AND SESSION MANAGEMENT 09

Bypassing client side control - Capturing user data, HTML forms and thick-client components - Active X controls - Prevention - Attacking authentication - Design flaws - Implementation flaws in authentication - Prevention - Attacking session management - Weakness in session management generation and handling- Attacking access control.

MODULE III VULNERABILITIES AND PREVENTION 09

Common vulnerabilities, Its prevention - Code injection - Injection into SQL, OS commands, web scripting techniques, SOAP, XPath, SMDP, LDAP - Attacking path traversal - Finding and exploiting path traversal vulnerabilities- Its prevention - Attacking Users: Other Techniques.

MODULE IV TOOLS AND TECHNOLOGIES 10

Security tools and services - Time-based one-time passwords - Challenge/ response one-time password - Lamport's one-time password algorithm - Smart cards - RADIUS - SASl - Host-to-host authentication - PKI - Firewalls - Kinds of firewalls- Filtering services - Firewall engineering - Tunneling and VPNs - Secure communications over insecure networks - Kerberos authentication system - Hidden Markov model.

MODULE V CASE STUDY **09**

Microsoft Windows Systems Analysis- Linux Analysis - Defeating Anti-forensic Techniques- E-mail Analysis- Forensic Analysis of Mobile Devices.

L-45; P-30

REFERENCES :

1. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, Wiley Publications, ISBN: 978-1-118-02647-2, 2011.
2. Aaron Philip, David Cowen and Chris Davis, “Hacking Exposed -Computer Forensics“, 2nd Edition, Mc Graw Hill Publications, ISBN: 978-0-07-162678-1, 2010.

OUTCOMES :

Students who complete this course will be able to

- Apply suitable tools and techniques for enforcing system security.
- Analyze on system vulnerabilities and provide solutions to overcome them.
- Identify the authentication flaws in real time scenario.
- Express the different hacking techniques through case studies.
- Utilize the latest technology that is widely used by the digital forensic experts
- Define ethical and professional responsibility in digital forensics

CSC6242 SECURE SOFTWARE SYSTEMS

L	T	P	C
3	0	2	4

OBJECTIVES :

- To acquire the knowledge of design principles, guidelines and other fundamentals of software engineering
- To describe the various thread models in software systems
- To realize the secure software analysis
- To elaborate the software availability and reliability of the product
- To evaluate the performance of a UML
- To use UML case tools to extend security business process

MODULE I SOFTWARE RELIABILITY 08

Problem, Process, and Product - Problems of software practitioners - Approach through software reliability engineering - Experience with SRE - Defining the product - Testing acquired software - Reliability concepts - Software and hardware reliability

MODULE II SOFTWARE AVAILABILITY 09

Implementing Operational Profiles - Developing operation profiles - Applying operation profiles - Engineering “Just Right” Reliability- Defining “failure” for the product - Choosing a common measure for all associated systems - Setting system failure intensity objectives-Engineering software reliability strategies

MODULE III TEST CASES 10

Preparing for Test - Preparing test procedures - Preparing test cases - Planning number of new test cases- Allocating, Distributing and Detailing test cases- Executing Test - Invoking test- Identifying failures - Guiding Test - Deploying SRE

MODULE IV UML FOR SECURITY 09

UML - UML diagrams for security requirement - Security business process - Physical security - Security critical interaction - Security state - Analyzing Model - Notation - Formal semantics - Security analysis - Security Properties.

MODULE V DEVELOPING SECURE SYSTEM 09

UMLsec profile - Requirements - Design principles - Applying security patterns - Secure channels - Common electric purse specification -Developing secure Java

programs - Financial applications - Extending UML case tools - Automatic tools for UMLsec

L-45; P-30

REFERENCES :

1. John Musa D, “Software Reliability Engineering”, 2nd Edition, Tata McGraw Hill, ISBN: 1-4184-9387-2, 2008.
2. Jan Jurjens, “Secure Systems Development with UML”, 2nd Edition, Springer, ISBN: 3- 540-00701-6, 2010.

OUTCOMES :

Students who complete this course will be able to

- Recognize, identify and provide the current security issues in software engineering.
- Design the different software reliability strategies
- Analyze a given requirement analysis and develop a suitable object oriented design, implementation and testing in software system.
- Illustrate the various sources of test cases and apply in real time applications
- Implement professionalism, project management and legal framework for software development
- Choose appropriate tools for developing a software system

PROFESSIONAL ELECTIVES
ODD SEMESTER ELECTIVES LIST

CSCY126 HIGH PERFORMANCE COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES :

- To describe the detailed insight into the modern processors
- To illustrate the basic optimization techniques for serial code
- To outline fundamental concepts of parallel computers and parallelization
- To showcase programming threads and OpenMP
- To discuss the distributed memory programming constructs in MPI
- To highlight the CUDA's programming model

MODULE I MODERN PROCESSORS AND BASIC OPTIMIZATION TECHNIQUES FOR SERIAL CODE 09

Modern Processors Stored-program computer architecture – General purpose cache-based microprocessor architecture - Memory hierarchies – Multi core processors - Multithread processors - Vector processors - Basic optimization techniques for serial code - Common sense optimizations - Simple measures - large impact - Data Access Optimization **-** Balance analysis and light speed estimates-Storage order -Case study: The Jacobi algorithm and Dense matrix transpose - Algorithm classification and access optimizations.

MODULE II SHARED-MEMORY PROGRAMMING : THREADS 09

Introduction – Threads – Design concerns – semaphores – Applying semaphores in classical problems – Monitors – Applying monitors in classical problem - Dynamic Vs Static thread management –Debugging multithreaded applications – Higher-level constructs: multithreaded programming Vs threads

MODULE III SHARED MEMORY PROGRAMMING: OPENMP 09

Introduction - First openMP program – variable scope- loop level parallelism – Task parallelism – Synchronization constructs - correctness and optimization issues – A Case study : sorting in OpenMP

MODULE IV DISTRIBUTED MEMORY PROGRAMMING 09

Communicating processors – MPI – Core concept – First MPI program – Program structure – point to point communication – Non blocking communications – Error

reporting and handling – collective communications – communicating objects – Node management – one side communication – Input output consideration – combining MPI with threads – Debugging and profiling MPI programs – Case Study: Diffusion limited aggregation

MODULE V GPU PROGRAMMING 09

GPU Programming CUDA's programming Model – CUDA's execution model – CUDA compilation process – putting together a CUDA project – Memory hierarchy – optimization techniques – Dynamic parallelism – Debugging CUDA programs – profiling CUDA programs – CUDA and MPI – Case studies: fractal set calculation and Block Cipher encryption.

Theory :45

REFERENCES :

1. Georg Hager and Gerhard Wellein, "Introduction to High performance computing Scientists and Engineers(Chapman & Hall/CRC Computational Science)", 1st edition, CRC Press, ,Taylor and Francis Group, ISBN-13: 978-1439811924, 2016.
2. Gerassimos Barlas, Morgan Kaufmann, "Multicore and GPU Programming – An integrated Approach",– Imprint of Elsevier, ISBN-13: 978-0124171374, 2015
3. John Levesque and Gene Wagenbreth Chapman & Hall "High Performance Computing: Programming and Applications", ISBN 9781420077056, 2010
4. John L. Hennessy and David Patterson,"Computer Architecture- A Quantitative Approach", Elsevier, , ISBN-13: 978-0123838728, 2012
5. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing, Tata McGraw Hill, ISBN -13:978-1-25-902995-0, 2013

OUTCOMES :

Students who complete this course will be able to

- Possess the basic understanding of the modern processor architecture
- Demonstrate the parallelization, parallelism and parallel scalability
- Apply semaphores and monitors classical problems
- Implement Open MP programming to solve the sorting problems
- Review skills to communicate processors using MPI
- Develop CUDA's programming model to solve problems on a model of computation and simulate encryption systems

CSCY141 DATABASE SECURITY

L	T	P	C
1	0	2	2

OBJECTIVES :

- To expose the need for Database security in real time systems.
- To overview the fundamental concepts of Database Management systems.
- To compare the architecture model of various database systems.
- To give exposure to Database security architecture and password policies.
- To infer the impact of SQL injection in database systems.
- To focus on various auditing and security procedures for Database systems.

MODULE I INTRODUCTION 15

Security and Information technology - Database security – Security Architecture – Operating system Security fundamentals – Database Review – Password, Profiles, Privileges and Roles – SQL injection - Security Auditing and Testing.

MODULE II DATABASE SECURITY APPLICATION 15

Access control models and policy languages for XML – Database issues in trust management and negotiation – Towards secure outsourcing – Managing and Querying encrypted data – Security in Data Warehouses, OLAP and workflow systems – Secure semantic web services – Database Watermarking – Privacy preserving Datamining.

L-15; P-30

REFERENCES :

1. Alfred Basta , Melissa Zgola, “ Database Security”, Paperback ,1st Edition, ISBN : 9781435453906, 2012
2. Hassan A. Afyouni, “Database Security and Auditing: Protecting Data Integrity and Accessibility”, 1st Edition, ISBN : 9780619215590 , 2005
3. Ron Ben Natan,”Implementing Database Security and Auditing”, 1st Edition, ISBN: 9781555583347, 2005
4. Neagu Adrian,”Oracle 11G Anti-Hacker's Cookbook”, Paperback, ISBN: 978-1849685269, 2012.
5. Gertz, Michael, Jajodia, Sushil, ” Handbook of Database Security Applications and Trends” , Springer Science+Business Media, LLC, ISBN: 978-0-387-48532-4, 2008.

OUTCOMES :

Students who complete this course will be able to

- Define the basics of Database management systems.
- Compare and contrast different Database security architecture.
- Analyze the impact of SQL injection attacks and its remedies
- Design secured Database user profiles to protect against third parties.
- Provide solutions to overcome password and privilege exploitation.
- Apply different security testing methodology and audit the Database activities in real time environment.

CSCY142 ADVANCED DIGITAL FORENSICS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To lay down the fundamentals of digital forensics from the viewpoint of courtroom legalities.
- To introduce forensics concepts and practices focusing on networks and internet.
- To establish the know-how needed for digital forensics investigator role.
- To elaborate upon the evidence gathering over the internet.
- To gain the knowledge on digital investigations.
- To explore the current techniques and tools for forensic examinations.

MODULE I INTRODUCTION 09

Foundations of digital Forensics-Language of Computer Crime Investigation-Digital Evidence in the courtroom-Cybercrime law.

MODULE II DIGITAL CRIME 09

Conducting Digital investigations-Handling a Digital Crime Scene-Investigative reconstruction with Digital Evidence-Modus Operandi motive and technology.

MODULE III DIGITAL EVIDENCE AND CYBER TALKING 09

Violent Crime and Digital Evidence –Digital Evidence as Alibi-Computer Intrusions-Cyber Talking.

MODULE IV DIGITAL INVESTIGATORS 09

Computer Basics for Digital investigators-Applying Forensics Science to computers-Digital Evidence on different system.

MODULE V FORENSICS AND NETWORKS 09

Network basics for Digital Investigators-Applying Forensic science to Networks-Digital Evidence on the internet, Mobile device forensics, cloud forensics.

Theory 45

REFERENCES :

1. Eoghan Casey, “Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet“, 3rd Edition ,Published by Elsevier, 2011.

2. Keith John Jones, Richard Bejtlich, Curtis W. Rose, “Real Digital Forensics: Computer Security and Incident Response”, 5th printing, Addison Wesley Professional, 2008.
3. Terrence V. Lillard, Clint P. Garrison, “Digital Forensics for Network, Internet, and Cloud Computing: A Forensic evidence Guide for Moving Targets and Data”, 1st Edition, Elsevier 2010.
4. John Sammons, The Basics of Digital Forensics, The Primer for Getting Started in Digital Forensics, 2nd Edition, Elsevier, 2014.

OUTCOMES :

Students who complete this course will be able to

- Recognize the role of digital forensics in the real world.
- Identify and extract digital evidence from varied networking layers.
- Apply forensics techniques for analyzing computer systems and networks.
- Assess digital evidence and practice forensic investigation.
- Describe the legalities, penalties, and punishment associated with cyber.
- Identify the current techniques and tools for forensic examinations.

CSCY143 SECURITY IN SMART DEVICES

L	T	P	C
3	0	0	3

OBJECTIVES :

- To provide a practical, fast-track approach to protecting a mobile device from security threats
- To introduce products of Mobile Device Management and solutions
- To showcase the different security model of Android and iPhone
- To discuss important hacker protection, loss/theft protection, backing up and restoring data
- To offer critical advice for deploying enterprise network protection for mobile devices
- To walk through the advantages of granular application access control and enforcement with VPN

MODULE I LIVING IN A MOBILE WORLD 09

The dangers of mobile computers, precursors to the smart phone revolution – Internet, social-networking, and spam-The new mobile world-Mobile purchasing and identification methods-The cloud –malware, phishing, spear phishing, virus/worms/others, future threads, steps to protect the mobile. Protecting the corporations, corporate security policies, corporate security procedures, frontend network protection.- Mobile Malware and Smart Device Security: Trends, Challenges and Solutions

MODULE II USERS AND MOBILE DEVICE MANAGEMENT 09

Protecting the corporations- mobile and business-Mobile Device Management - Mobile Device Management, details of MDM, MDM solutions and products, Mobile Acceptable Use Policy (AUP)-Development Security, The Mobile Risk Model.

MODULE III PROTECTING MOBILE DEVICES 09

Android and iPhone - Security Model, Data encryption, downloaded applications, Mobile malware, Trojans and malware, compromised accounts, stolen or lost devices.

MODULE IV SUPPORT AND WARRANTY INSURANCE 09

The smart phone - OS operators, manufactures and service providers, hardware, Operating System or user interface, Application issues, Strangers and dangers, and unlimited damage - Devices profiles, device hacks, profile hacks or both, the device type, BYOD

MODULE V SECURING SMART DEVICE ACCESS 09

Securing Data in Transit with VPNs - Connecting to Wi-Fi Networks -Securing Each Smart Device- Device Security Component Overview- Hacker Protection and Enforceable Encryption - Protecting Against Loss and Theft - Educating Users about Backing Up Data - Securing Mobile Applications

Theory 45

REFERENCES :

1. Timothy Speed and Darla Nykamp , “Mobile Security: How to Secure, Privatize, and Recover Your Devices”, ISBN: 978-1-118-09380-1, 2013
2. Rich Campagna, Subbu Iyer, Ashwin Krishnan, Mark Bauhaus , “Mobile Device Security For Dummies”, Wiley Publication, ISBN: 978-1-118-09380-1 , 2011
3. Neil Bergman, Mike Stanfield , Jason Rouse , Joel Scambray, “ Hacking Exposed Mobile: Security Secrets & Solutions” , ISBN-13: 978-0071817011, 2013
4. Himanshu Dwivedi, Chris Clark, David Thiel, “Mobile Application Security”, 1st Edition, ISBN-13: 978-0071633567, 2013.
5. Stephen Fried, “Mobile Device Security: A Comprehensive Guide to Securing Your Information in a Moving World”, 1st Edition, ISBN-13: 978-1439820162, 2010

OUTCOMES :

Students who complete this course will be able to

- Identify the different malware, phishing, virus, worms in mobile
- Guard the corporations and security policies and procedures and front end network
- Develop Mobile Device Management to secure the mobile.
- Apply the different encryption model and access control methods to protect Android and iPhone
- Protect the data in transit with VPNs
- Secure the different mobile applications

CSCY144 SECURITY ISSUES IN CLOUD COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES :

- To introduce the students to the world of cloud computing security.
- To provide a consistent way of developing cloud security competency.
- To Provide the knowledge and confidence to build/adopt secure cloud solutions.
- To discuss the basic cloud computing architecture.
- To illustrate data and information security in cloud computing.
- To evaluate the internal cloud.

MODULE I INTRODUCTION TO CLOUD COMPUTING AND SECURITY 10

Terminology - Risk, Perception of Risk and Cloud Computing - Introduction to Cloud Computing and Security - Understanding Cloud Computing -The IT Foundation for Cloud - The Bottom Line - An Historical View: roots of Cloud Computing - A Brief Primer on Security - A Brief Primer on Architecture - Security Architecture.- From Architecture to Efficient and Secure Operations - Security Operations Activities.

MODULE II SECURING THE CLOUD: ARCHITECTURE 09

Introduction to Cloud Computing Architecture - Security Concerns - Assessing Your Risk Tolerance in Cloud Computing - Legal and Regulatory Issues - Security Requirements for the Architecture - Security Patterns and Architectural Elements - Cloud Security Architecture - Planning Key Strategies for Secure Operation.

MODULE III DATA SECURITY AND AN INFORMATION SECURITY FRAMEWORK 10

Overview of Data Security in Cloud Computing - Data Encryption: Applications and Limits - Cloud Data Security: Sensitive Data Categorization - Cloud Data Storage - Cloud Lock-in - Effectively Managing Risk - Overview of Security Controls - The Limits of Security Controls - Security Monitoring. Evaluating Cloud Security - Checklists for Evaluating Cloud Security

MODULE IV BUILDING AN INTERNAL CLOUD 08

Private Clouds: Motivation and Overview - Security Criteria for Ensuring a Private Cloud - Selecting a CSP: Overview of Assurance - Selecting a CSP:Overview of Risks - Selecting a CSP: Security Criteria.

MODULE V METHODS , TECHNOLOGIES AND APPLICATIONS 08

Campus Cloud Storage and Preservation -From Distributed File System to Data Sharing Service - An Infrastructure-Service Cloud: On-Demand Resource Provisioning Reliability Analysis of Service Composition with Service Pools and Optimal Configuration of Service Pool Size.

Theory 45

REFERENCES :

1. Lu Liu, Xiaoyu Yang “Principles, Methodologies, and Service-Oriented Approaches for Cloud Computing” Business Service Publication, ISBN 978-1-4666-02856-1,2013.
2. Hamid Nemati, “Optimizing Information Security and Advancing Privacy Assurance”,1st Edition, IGI Global, ISBN 978-1-4666-0028-7, 2012.
3. Vic J.R. Winkler, “Securing the Cloud: Cloud Computer Security Techniques and Tactics”, 1st Edition, Elsevier Syngress, ISBN 978-1- 59749 -592 -9, 2011.

OUTCOMES :

Students who complete this course will be able to

- Enumerate Cloud Computing Architectural Frameworks.
- Discuss the major security considerations for building or selecting a cloud model.
- Examine security criteria to enable selection of a CSP.
- Evaluate the conditions under which one should adopt Cloud Computing services and technologies.
- Demonstrate the cloud deployment and cloud formation.
- Evaluate the methods, technologies in cloud security.

CSCY145	PUBLIC KEY INFRASTRUCTURE AND KEY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To provide high level understanding certificate and Trust models.
- To explain the main phases in the lifecycle of a cryptographic key.
- To explore concepts of the cryptography techniques.
- To recognize the basic differences between Cryptography Techniques.
- To indicate the types of application where cryptography techniques and key management techniques are most appropriate.
- To study advanced security issues in cryptographic applications.

MODULE I INTRODUCTION 08

The Purpose of PKI – Certificates – X.509 Certificates – Attribute Certificates – CV Certificates – PGP Certificates – Other Certificates – Trust Models – Web of Trust – Hierarchical Trust – Combining Trust Hierarchies.

MODULE II PRIVATE KEYS 08

Private Key Life Cycle– Personal Security Environments– Software PSEs– Hardware PSEs– Revocation – Certificate Revocation Lists - Validity Models - Certification Service Provider - Certificate Life Cycle - Certificate Policies.

MODULE III SYMMETRIC ENCRYPTION 09

Classification of Symmetric Encryption algorithms – Stream Ciphers – Block Ciphers – The Data Encryption Standard – The Advanced Encryption Standard – Modes of Operation - Public Key Encryption.

MODULE IV SECURITY 10

Data Integrity – Different Levels of Data Integrity – Hash functions – Authentication Codes - Digital Signature Schemes – Entity authentication – Cryptographic Protocols.

MODULE V KEY MANAGEMENT 10

Key Management fundamentals – Certification of public keys – Certificate life cycle – Key pair changes – Public key certificate management models – Alternate approaches – Cryptographic Applications.

Theory 45

REFERENCES :

1. Johannes A. Buchmann, Evangelos Karatsiolis, Alexander Wiesmaier, “Introduction to Public Key Infrastructures”, Springer,(Unit I,II) ISBN: 978-3-6424-0657-7,2013
2. Keith M. Martin, “Everyday Cryptography: Fundamental Principles and Applications” Oxford University press, ISBN: 978-0-1996-9559-1(Unit III,IV,V), 2012.
3. Kevin Roebuck, Public Key Infrastructure (PKI): High-impact Strategies, Emereo Pty Limited, ISBN : 978-1-7430-4550-3, 2011.
4. Elaine Barker, Framework for Designing Cryptographic Key Management Systems, DIANE Publishing, ISBN : 978-1-4379-8008-0, 2011.

OUTCOMES :

Students who complete this course will be able to

- Categorize and summarize key techniques and its importance.
- Explore cryptography techniques for confidentiality related security issues in networks.
- Analyze the cryptography techniques implemented in a Web environment.
- Develop Trust models to simulate complex systems.
- Apply the cryptography techniques in real time applications.
- Identify appropriate key management techniques for real time application environments.

CSCY146 SERVICE ORIENTED ARCHITECTURE

L	T	P	C
3	0	0	3

OBJECTIVES :

- To establish the fundamentals and issues relating to Service Oriented Architecture.
- To bring out the importance of service orientation and web services.
- To teach appropriate tools as technique on how to build the Service Oriented Architecture with web services.
- To gain knowledge of basic principles of Service-Oriented Architecture and apply these concepts to develop a sample application
- To assess emerging and proposed standards for the main components of Web services architectures.
- To become skilled at standards related to Web services: Web Services Description Language (WSDL), Simple Object Access Protocol (SOAP), and Universal Description, Discovery and Integration (UDDI).

MODULE I INTRODUCTION 09

Basic definition - Fundamentals of SOA - Characteristics about SOA-Benefits and pitfalls of SOA. Evolution of SOA - Web service and primitive SOA - The extension of SOA - Web service extension.

MODULE II WEB SERVICE AND CONTEMPORARY SOA 09

Message Exchange Pattern- Service Activity- Coordination- Atomic Transaction- Business Activity- Orchestration – Choreography- Addressing Reliable Messaging- Correlation and Policies- Meta data Exchange- Security Notification and Eventing.

MODULE III PRINCIPLES OF SERVICE ORIENTATION 09

Principles of service orientation -Building SOA-Planning and Analysis- SOA delivery strategies -Service Oriented Analysis Introduction -Service Modeling of Service Oriented Analysis.

MODULE IV SERVICE ORIENTED DESIGN 09

Introduction to service oriented design - WSDL related XML Schema language - WSDL Language Basics - SOAP Language Basics - Service interface design tools - Steps to composing SOA - Consideration for choosing service layers - SOA extension - Service design and business process design.

MODULE V WEB SERVICE EXTENSION AND SOA PLATFORM 09

WS Addressing language Basics - WS Reliable Messaging language Basics- policy Language Basics- WS Metadata Exchange Language Basics- WS security Language Basics -SOA Platform basics- SOA Support in J2EE, SOA Support in .NET- Case Studies.

Theory 45

REFERENCES :

1. Thomas Erl, “Service Oriented Architecture, Concepts, Technology and Design”, Pearson Education, ISBN-13: 007-6092038498, 2009.
2. Thomas Erl, “Service Oriented Architecture, Design Patterns”, Prentice Hall, ISBN-13: 978-0-13-613516-6, 2009
3. Shankar Kambhampaty, “Service Oriented Architecture for Enterprise Architecture for Enterprise Application”, 1st Edition, Wiley Publication, 2008.

OUTCOMES :

Students who complete this course will be able to

- Relate web services with service oriented architecture.
- Analyze the issues related to SOA.
- Apply the tools and technique for Service Oriented Architecture.
- Develop service design using WSDL and XML schema languages.
- Choose appropriate SOA extensions for a particular design
- Assess SOA platform supported by J2EE and .NET.

CSCY147 TECHNICAL FOUNDATION OF E-COMMERCE

L	T	P	C
3	0	0	3

OBJECTIVES :

- To provide awareness on best practices for E-commerce
- To discuss various factors in building E-commerce Systems
- Impart knowledge in privacy and security issues in E-commerce
- To highlight upon E-commerce laws and ethics
- To describe the life cycle of implementation of E-commerce solutions
- To explain the modes of payments involved in online transactions of various kinds

MODULE I INTRODUCTION 09

Electronic commerce and Physical Commerce- Different type of ecommerce-some e-commerce scenario- Advantages of e-commerce- E-Commerce infrastructure-Client side Programming, Server Side Programming.

MODULE II BUILDING E-COMMERCE SYSTEMS 09

Building E-commerce systems –software for E-commerce systems-Hardware for E-commerce systems-Scalability–E-commerce web system development life cycle-HCI for E-commerce: User experience design-Designing E-commerce for Mobile systems - Cloud services and computing in E-commerce.

MODULE III E-COMMERCE SOFTWARE 09

Multi tier architecture –web server software-Application server software-database software-Dynamic web page programming languages-MVC Frameworks-Ecommerce system tools and personalization tools –web site management tools-Intelligent Agents.

MODULE IV PAYMENT SYSTEMS AND SECURITY 09

Electronic payment systems: Credit cards –Debit cards - Online transactions. Security Threats in E-commerce- Vulnerability in client side, server side and in communication medium-Technology and solutions: Encryption, SSL VPN, firewalls-server and client side protection. SET: Key Technologies in Secure Electronic Transactions.

MODULE V ETHICS, LEGALITY AND POLICIES 09

Marketing and promotion of e-business -E-commerce security policy, Laws and Cyber Forensics an overview- Ethics in E-commerce

Theory 45

REFERENCES :

1. Kenneth C. Laudon “E-Commerce: Business, technology, Society” 12th Edition, Pearson, ISBN: 9780133938951, 2016.
2. Dave Chaffey, ”E-Business and E-commerce Management”, 5th Edition, Prentice Hall, ISBN: 9780273752011, 2011.
3. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, “E-Commerce, Fundamentals And Applications”,1st Edition, Wiley, ISBN: 978-8126514694, 2007.
4. PaulTodd, “E Commerce Law”, Cavendish Publishing Company, ISBN: 9781859419427, 2005.

OUTCOMES :

Students who complete this course will be able to

- comprehend the basic economic mechanisms and driving forces of E-Commerce
- design and implement an e-commerce application with a shopping cart
- formulate E-Commerce strategies and provide a business solution.
- analyze different types of portal technologies and deployment methodologies commonly used in the industry.
- Integrate user-centered design guidelines in developing user-friendly websites
- analyze ethical, social and political issues in E-Commerce.

MAC6194 OPERATIONS RESEARCH

L	T	P	C
3	0	0	3

OBJECTIVES :

- To teach about linear programming techniques, transportation and assignment problems.
- To study the concept of queuing models and advanced queuing models which provides models for a number of situations that arise in real life.
- To gain the knowledge of simulation and non-linear programming of scheduling algorithms.

MODULE I LINEAR PROGRAMMING 08

Formulation – Graphical solution – Simplex method – Two phase method – Transportation and Assignment Problems.

MODULE II SCHEDULING BY PERT AND CPM 08

Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling.

MODULE III INVENTORY MODELS 08

Inventory models – Deterministic models – Production models – Economic ordering quantity – Buffers stock – Shortage and quantity discount – Probabilistic inventory model – EOQ and safety stock calculation.

MODULE IV QUEUEING MODELS 07

Poisson Process – Markovian Queues – Single and Multi-server Models – Little's formula – Machine Interference Model – Steady State analysis – Self Service Queue – Network Optimal Path.

MODULE V SIMULATION 07

Discrete Event Simulation – Monte-Carlo Simulation – Stochastic Simulation– Applications to Queuing systems.

MODULE VI NON-LINEAR PROGRAMMING 07

Lagrange multipliers – Equality constraints – Inequality constraints – KuhnTucker conditions – Quadratic Programming.

Theory 45

REFERENCES :

1. Winston.W.L. 'Operations Research', 4th Edition, Thomson – Brooks/Cole, 2003.
2. Taha, H.A., "Operations Research: An Introduction", 9th Edition, Pearson Education Edition, Asia, New Delhi, 2002.
3. Sharma J.K., "Operations Research: Theory and Applications", Macmillan India Ltd., 3rd Edition, 2006.
4. Robertazzi. T.G., "Computer Networks and Systems – Queuing Theory and Performance Evaluation", 3rd Edition, Springer, 2002 Reprint.
5. Ross. S.M., "Probability Models for Computer Science", 2nd Edition, Academic Press, 2002.

OUTCOMES :

Students who complete this course will be able to

- use various queuing models in various domains.
- complete simple exercises on linear programming techniques, transportation and assignment problems.
- apply simulation to various situations and scheduling techniques.

EVEN SEMESTER ELECTIVES LIST

CSCY202 MOBILE ADHOC NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To provide a broad overview of the state of wireless and mobile ad hoc networking.
- To discuss physical, networking and architectural issues of mobile ad hoc networks.
- To elaborate the functions of various routing protocols under unicast, multicast and transport layer protocols.
- To give a knowledge about issues in QoS, energy management of mobile ad hoc networks
- To learn the various security mechanism used in mobile adhoc networks.
- To study the current technology trends for the implementation and deployment of mobile ad hoc networks.

MODULE I INTRODUCTION 09

Introduction – Fundamentals of wireless communication technology – The Electromagnetic spectrum – Radio propagation mechanisms – Characteristics of the wireless channel – IEEE 802.11a,b standard – Origin of Ad hoc: Packet radio networks – Technical challenges – Architecture of PRNETs – Components of packet radios – Adhoc wireless networks – Heterogeneity in mobile devices– Wireless sensor networks – Traffic profiles – Types of Ad hoc mobile communications – Types of mobile host movements – Challenges facing Ad hoc mobile networks – Ad hoc wireless internet.

MODULE II ROUTING PROTOCOLS 09

Introduction – Issues in designing a routing protocol for Ad hoc wireless networks – Classifications of routing protocols – Table-Driven routing protocols– Destination Sequenced Distance Vector (DSDV) – Source-Initiated On-Demand approaches – Ad hoc On-Demand Distance Vector Routing (AODV)– Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) –Location–Aided Routing (LAR) – Power-Aware Routing (PAR) – Zone Routing Protocol (ZRP).

MODULE III MULTICASTING AND SECURITY PROTOCOLS 09

Introduction – Issues in designing a multicast routing protocol – Operation of multicast routing protocols –Classifications of multicast routing protocols – Tree-Based multicast routing protocols – Mesh-based multicast routing protocols. Security in Ad hoc wireless networks – Network security requirements – Issues and challenges in security provisioning – Network security attacks – Key management – Secure routing in Ad hoc wireless networks.

MODULE IV TRANSPORT LAYER PROTOCOLS 09

Introduction – Issues in designing a transport layer protocol for Ad hoc wireless networks – Design goals of a transport layer protocol for Ad hoc wireless networks –Classification of transport layer solutions – TCP over Ad hoc wireless networks – Other transport layer protocols for Ad Hoc wireless networks.

MODULE V QOS AND ENERGY MANAGEMENT 09

Introduction – Issues and challenges in providing QoS in Ad hoc wireless networks –Classifications of QoS solutions – MAC layer solutions – Network layer solutions– Introduction – Need for energy management in Ad hoc wireless networks – Classification of energy management schemes – Battery management schemes– Transmission power management schemes – System power management schemes.

Theory 45

REFERENCES :

1. C.Siva Ram Murthy and B.S.Manoj,"Ad hoc Wireless Networks Architectures and Protocols", 2nd Edition, Pearson Education, ISBN-13: 9780133007060, 2012.
2. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic " Mobile Ad Hoc Networking: The Cutting Edge Directions", 2nd Edition, Wiley-IEEE Press, ISBN: 978-1-118-08728-2,2013.
3. Jonathan Loo, Jaime Lloret Mauri, Jesús Hamilton Ortiz,"Mobile Ad Hoc Networks: Current Status and Future Trends" CRC Press, ISBN 9781439856505, 2012.

OUTCOMES :

Students who complete this course will be able to

- Assess the platform architectures that are suitable for Mobile Adhoc networks.

- Identify the issues in wireless networks and how they can be addressed.
- Examine the various security threats to ad hoc networks and propose the solutions.
- Analyze the issues in designing the multicasting and security protocols for Mobile Adhoc networks.
- Analyze the challenges in designing the routing and transport protocols for Mobile Adhoc networks.
- Implement the various schemes to improve the quality of service in mobile Adhoc networks.

CSCY207 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVES :

- To provide tools and techniques for project monitoring.
- To evaluate and assess the projects in Software Project Management.
- To find the cost of the project using cost benefit evaluation techniques
- To produce an activity plan for a project
- To identify the factors that influence people's behavior in a project environment.
- To improve group working and to select appropriate leadership styles.

MODULE I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 09

Project Definition – Contract Management – Activities covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

MODULE II PROJECT EVALUATION 09

Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

MODULE III ACTIVITY PLANNING 09

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

MODULE IV MONITORING AND CONTROL 09

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

MODULE V MANAGING PEOPLE AND ORGANIZING TEAMS 09

Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldham – Hackman Job Characteristics Model – Working In

Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.

Theory : 45

REFERENCES :

1. Bob Hughes, “Mike Cotterell, Rajib Mall, Software Project Management”, 5th Edition, The McGraw-Hill Higher Education, ISBN :13:978-0-07-10724-8 , 2011.
2. Robert K. Wysocki, “Effective Project Management – Traditional, Agile, Extreme”, 6th Edition, Wiley Publication, ISBN: 1118080653, 2011.
3. Robert K. Wysocki, “Effective Software Project Management”, 3rd Edition, Wiley Publication, ISBN: 9780764596360, 2010.
4. MuraliChemuturi, Thomas M. Cagley , “Mastering Software Project Management: Best Practices, Tools and Techniques”, J.Ross publishing, ISBN:9781604270341, 2010
5. S. A. Kelkar, “Software Project Management: A Concise Study”, 3rd edition, PHI learning pvt Ltd ,ISBN: 9788120347021, 2013.

OUTCOMES :

Students who complete this course will be able to

- Practice the process of project management and its application in delivering successful IT projects
- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities
- Use risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales
- Identify the resources required for a project and to produce a work plan and resource schedule
- Monitor the progress of a project and to assess the risk of slippage, revising targets or counteract drift
- Distinguish between the different types of project and follow the stages needed to negotiate an appropriate contract.

CSCY241 INTRUSION DETECTION

L	T	P	C
2	0	2	3

OBJECTIVES :

- To explore the basic concepts of Intrusion Detection Systems.
- To summarize the network attacks and detection approaches.
- To illustrate the theoretical foundation of Intrusion Detection system.
- To describe the architectural and organizational issues in the Intrusion infrastructure.
- To gain the knowledge of designing a Intrusion Infrastructure.
- To outline the commercially available intrusion detection systems.

MODULE I INTRODUCTION 08

Cyber Intrusions – Intrusion Detection systems – Collaborative intrusion detection Networks - Overview of existing Intrusion Detection Networks – Selected Intrusion Detection Networks.

MODULE II NETWORK ATTACKS AND DETECTION APPROCHES 08

Attack Taxonomies – Probes – Privilege Escalation Attacks – DoS and DDoS Attacks – Worm attacks – Routing Attacks – Misuse Detection – Anomaly Detection – Specification Detection – Hybrid Detection – Data Collection.

MODULE III THEORITICAL FOUNDATIONS OF DETECTION 10

Taxonomy of Anomaly Detection Systems – Fuzzy Logic – Bayes Theory- Artificial Neural Networks – Support Vector Machine – Evolutionary Computation – Association rules – Clustering – Comparative Study of Anomaly Detection Techniques - Architecture and Implementation – Alert Management and Correlation – Evaluation. Examples of Commercial and Open Source IDSs.

MODULE IV DESIGN OF INTRUSION INFRASTUCTURE 10

Collaboration Framework – Privacy issues – Insider Attacks – Trust Management model – Text Message Exchange rate and Scalability – Robustness against common Treats – Simulation and Experiment Results – Collaborative Decision Model –Sequential Hypothesis Testing – Performance Evaluation - Resource Management and Incentive Design – Primal and Dual Iterative algorithm – Experiments and Evaluation.

MODULE V HOST BASED INTRUSION DETECTION 09

Instant OSSEC Host - Based Intrusion Detection - Installation – Configuring the OSSEC server – Getting agents to Communicate – Managing Agents keys automatically – Writing Your own rules – Configuring the alerts – File integrity monitoring – Monitoring the windows Registry.

L-30; P-30

REFERENCES :

1. Carol Fung, Raouf Boutaba, Intrusion Detection Networks : A Key to Collaborative Security, CRC Press Taylor and Francis Group, ISBN:978-1-4665-6412-1 (Unit I,IV), 2014.
2. Ali A. Ghorbani, Wei Lu and Mahbod Tavallaee, Network Intrusion Detection and Prevention Concepts and Techniques, Third Edition, Springer, ISBN: 978-0-387-88770-8(Unit II,III), 2010.
3. Brad Lhotsky, Instant OSSEC Host-Based Intrusion Detection System, Packt Publishing, ISBN: 978-1-78216-764-8(UNIT V), 2013.
4. Al-Sakib Khan Pathan, The State of the Art in Intrusion Prevention and Detection, CRC Press Taylor and Francis Group, ISBN 978-3-4822-0353-6, 2014
5. Ankit Fadia, Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection , Thomson Course Technology,.ISBN - 1 – 59863-413, 2008.

OUTCOMES :

Students who complete this course will be able to

- Describe intrusion detection principles and detection approaches of Intrusion detection Systems.
- Design of intrusion infrastructure and evaluate the performance of the system.
- Illustrate the theoretical foundations for intrusion detection.
- Analyze the issues of Intrusion infrastructure.
- Gain experience of doing study and research in commercially available intrusion detection systems
- Implement the Simple problems in OSSEC Host based Intrusion Detection System.

CSCY242 GAME THEORY AND ITS APPLICATIONS

L	T	P	C
1	0	2	2

OBJECTIVES:

- To introduce the basic strategy types of games
- To explore the theoretical basis of multi agent systems.
- To describe the base for rational decision making.
- To discuss the different strategies for game development.
- To explore the design models for game development.
- To illustrate the characteristic of cooperative games

MODULE I INTRODUCTION 15

Introduction-Normal Form representation-Nash equilibrium-Mixed Strategies-Nash theorem-Dynamic Games- Cooperative Games-Multistage games-Bayesian games-Auctions-game Tree.

MODULE II APPLICATIONS OF GAME THEORY 15

Game theory in mobile ad hoc networks-Game theory based solutions for network security-Using game theory to improve strategic decision making in business-Role of game theory in bop technology-Platforms - Raspberry Pi – Raspbian - Arduino – Contiki – Kaa – AllJoyn – BeagleBone - Applications in Automobile/Mechanical streams.

L-15; P-30

TEXT BOOKS:

1. Steven Tadelis, “Game Theory: An Introduction”, 2nd Edition, Princeton University Press, 2013.
2. E. N. Barron, “Game Theory: An Introduction”, 2nd Edition, Wiley India Pvt Ltd, 2013.
3. BezalelPeleg, Peter Sudholter,”Introduction to the Theory of Cooperative Games”, 2nd Edition, Springer, 2010.
4. Thomas J Webster, “Introduction to Game Theory in Business and Economics”, 1st Edition, Segment Books, 2009.

OUTCOMES :

Students who complete this course will be able to

- Compare the computer graphics and multimedia concepts.
- Build animated programs.

- Design games without theory of linear programming.
- Model interaction game between two or more players with in set of rules.
- Identify the threats of cooperative games.
- Construct game theoretical model in applied fields.

CSCY243 MOBILE AND WIRELESS NETWORK SECURITY

L	T	P	C
2	0	2	3

OBJECTIVES :

- To have an exposure on the basics of wireless networks.
- To gain knowledge about the wireless LAN and WAN concepts.
- To study the protocols and functions of adhoc and sensor networks.
- To enhance students' understanding of wireless MAN and PAN networks.
- To identify the different security threats in wireless networks.
- To provide experience in deploying wireless enterprise network and the issues related to it.

MODULE I INTRODUCTION TO MOBILE AND WIRELESS NETWORKS 09

Mobile cellular networks: cellular networks basic concepts, IEEE wireless networks: WLAN 802.11, WPAN 802.15, WMAN 802.16, WMAN mobile 802.20, MIH 802.21, Mobile internet networks : micro mobility, macro mobility, Current trends, Applications.

MODULE II WIRELESS LANS AND WANS 09

Types of wireless LANs, WLAN infrastructure devices, physical layer standards, media access control layer standards, WLAN management and architectures, Wan network, topologies, Wireless WAN 802.16 Wimax, characteristics of wireless WAN services

MODULE III ADHOC AND SENSOR NETWORKS 09

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, fundamentals of MAC protocol and flat routing protocols.

MODULE IV WIRELESS MANS AND PANS 09

Wireless MANs – IEEE 802.16 Wimax, mesh networks – Ricochet – Wireless PAN – Bluetooth systems – architecture and functions.

MODULE V SECURITY IN WIRELESS NETWORKS 09

Attacks on wireless networks, Attacking wireless clients, wireless security defenses, deploying WPA enterprise network, secure wireless network, handling wireless access, rogue points, future of wireless security.

L-30; P-30

REFERENCES :

1. Hakima Chaouchi, Maryline Laurent-Maknavicius, “Wireless and Mobile Networks Security”, John Wiley & Sons, ISBN 978-1-84821-117-9, 2013.
2. Mark Ciampa , “Guide to Wireless LANs”, Cengage Learning, ISBN 978-1-133-13217-2, 2012.
3. Tamara Dean, “Network+ Guide to networks”, Cengage Learning, ISBN 9781133608196, 2012.
4. Dharma Prakash Agrawal & Qing-An Zeng, “Introduction to Wireless and Mobile Systems”, Cengage Learning, *ISBN* 1305087135, 2015.
5. Subir Kumar Sarkar, T.G. Basavaraju, C. Puttamadappa, “Ad Hoc Mobile Wireless Networks: Principles, Protocols, and Applications”, CRC press, *ISBN* 9781466514461, 2013.
6. Tyler Wrightson, ”Wireless network security A Beginner's Guide”, McGraw Hill Professional, *ISBN* 0071760954, 2012.

OUTCOMES :

Students who complete this course will be able to

- determine the basic functionalities and working principles of wireless networks.
- comprehend different generation of wireless networks and protocol architectures.
- know the WLAN and WAN topologies and deployment.
- gather knowledge on adhoc and sensor network protocols
- examine various security threats to wireless & mobile networks
- have an exposure on the deployment of WPA enterprise network and rogue point usage.

CSCY244 BIOMETRIC SECURITY

L	T	P	C
1	0	2	2

OBJECTIVES :

- To introduce the fundamentals of biometric security.
- To focus on the design principles of biometric systems
- To equip the student on the algorithms used in biometric systems.
- To provide understanding on the various applications of biometric systems
- To gather knowledge on the attacks in biometric systems.
- To develop the skills of the students with this technology for improving security and trust in different fields of modern society.
-

MODULE I BIOMETRICS DESIGN AND APPLICATIONS 15

Overview of biometrics and biometrics systems – components of biometric systems – types of biometrics - Design cycle of biometric systems – Categorizing biometric applications – fingerprint recognition- face recognition – iris recognition – Gait – hand geometry – Soft biometrics – security of Biometric systems.

MODULE II BIOMETRICS PRACTICAL APPROACH 15

Designing Applications – Human factors – implementation factors – Installation and commissioning – Performance simulator – variability simulator – template and threshold analyser – Using the Bantam program manager – document manager – report manager – personnel manager – supplier manager – training manager – technology futures.

L-15; P-30

REFERENCES :

1. Marina L. Gavrilova, Maruf Monwar, “Multimodal Multimodal Biometrics and Intelligent Image Processing for Security Systems”, Idea Group Inc , ISBN 9781466636460, 2013.
2. Ravi Das, “Biometric Technology: Authentication, Biocryptography, and Cloud-Based Architecture”, CRC Press, ISBN 9781466592452 , 2014.
3. Anil Jain, Arun A. Ross, Karthik Nandakumar, “Introduction to Biometrics”, Springer Science and Business media, ISBN: 978-0-387-77325-4 , 2014.
4. Julian Ashbourn, “Biometrics - from aspiration to implementation “, Springer Science and Business media, ISBN: 978-1-4471-6716-7, 2015.

OUTCOMES :

Students who complete this course will be able to

- Summarize the concepts of biometrics and its applications in various fields.
- Gain knowledge on the design and features of biometric systems.
- Have an exposure on the matching algorithms used in biometric applications.
- Recollect the working principles of various biometric systems based on fingerprints, iris, retina, gait and hand geometry.
- Design a biometric system for more secure and reliable transmission.
- Describe the various attacks on biometric systems and its countermeasures.

CSCY245 ADVANCED ALGORITHMS

L	T	P	C
3	0	0	3

OBJECTIVES :

- To explore the relevance of algorithm analysis.
- To design of efficient computer algorithms.
- To demonstrate and apply the algorithms, prove their correctness.
- To analyze time complexity of the algorithms in a mathematical concepts.
- To elucidate the basic idea behind the techniques.
- To develop algorithms for new problems where these techniques can be applied.

MODULE I INTRODUCTION 08

The role of Algorithms in Computing – Getting Started – Analyzing algorithms- Designing Algorithms–Growth of Functions – Divide and conquer – Probabilistic Analysis and Randomized Algorithms.

MODULE II SORTING AND ORDER STATISTICS 08

Heap sort – Priority Queue – Quick Sort –Performance and analysis of quick sort- Sorting in Linear time – Counting sort-Radix Sort- Bucket Sort – Binary search Tress – Red Black trees.

MODULE III ADVANCED DESIGN AND ANALYSIS TECHNIQUES 09

Dynamic Programming–Rod cutting-Matrix-chain multiplication- Optimal Binary search trees – Greedy Algorithms- An activity-selection problem- Elements of the greedy strategy –Huffman codes – Matroids – Amortized Analysis – Aggregate analysis – The accounting method - Potential method.

MODULE IV GRAPH ALGORITHMS 10

Elementary Graph Algorithms –Breadth-first search- Depth-first search – Topological sort - Minimum Spanning Trees – The algorithms of Kruskal and Prim - Single-Source Shortest Paths Bellman-Ford algorithms- Dijkstra's algorithm–All-pairs Shortest Paths – Maximum Flow – Dynamic Tables.

MODULE V ADVANCED ALGORITHMS 10

The naïve-matching algorithm – the Rabin-Karp algorithm – String matching with finite automata- The Knuth-Morris-Pratt algorithm – NP Completeness - Approximation Algorithms.

Theory : 45

REFERENCES :

1. Thomas H.Cormen, Charless E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, PHI Learning, ISBN: 978-0-262-53305-8, 2010.
2. Thomas H.Cormen “Algorithms Unlocked”, MIT Press, ISBN: 978-0-262-51880-2, 2013.
3. Michael Soltys, “An Introduction to the Analysis of Algorithm”, 2nd Edition, World Scientific, ISBN: 978-981-4401-15-9 , 2012.
4. Robert Sedgewik, Kevin wayne, “Algorithms”, 4th Edition, Pearson Education, ISBN:978-0-321-57351-3, 2011.

OUTCOMES :

Students who complete this course will be able to

- Explain the importance of algorithmic design.
- Explore the algorithm design and analysis techniques, NP-complete problems.
- Formulate and solve the research problems on complex algorithms.
- Analyze the problems and research issues in the field of complexity theory.
- Apply algorithms to solve new problems that may arise in various applications.
- Develop advanced algorithm analysis skills for analyzing the approximation ratio of approximation algorithms.

CSCY246 HUMAN ASPECTS OF COMPUTER SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES :

- To identify possible countermeasures against threats and vulnerabilities in a given security scenario.
- To develop a basic understanding of cryptography and some key encryption techniques used.
- Learn the requirements and mechanisms for identification and authentication.
- Know the mechanisms for securing the information.
- To compare and contrast the underlying security mechanisms needed to implement security countermeasures.
- Have a deeper knowledge on the design principles for database management systems security.

MODULE I THREATS AND SECURITY 09

Basic concepts: threats – Vulnerabilities – Controls – Risk - Confidentiality, integrity, availability- Security policies, security mechanisms – Assurance - Prevention, detection, deterrence.

MODULE II BASIC CRYPTOGRAPHY 09

Basic cryptographic terms: Historical background - Symmetric crypto primitives - Modes of operation - Cryptographic hash functions - Asymmetric crypto primitives.

MODULE III PROGRAM SECURITY 09

Flaws - Malicious code: viruses, Trojan horses, worms, Program flaws: buffer overflows, time-of-check to time-of-use flaws, incomplete mediation – Defenses - Software development controls Testing techniques.

MODULE IV AUTHENTICATION 09

Memory, time, file, object protection requirements and techniques - Protection in contemporary operating systems - Identification and authentication - Identification goals - Authentication requirements - Human authentication - Machine authentication.

MODULE V TRUSTED OPERATING SYSTEMS AND NETWORK SECURITY **09**

Assurance – trust: Design principles - Evaluation criteria - Evaluation process - Database management systems security, Network threats, Introduction to network security techniques, Intrusion detection - Management of security - Security policies- Risk analysis - Physical threats and controls.

Theory 45

REFERENCES :

1. William Stallings, “Cryptography and Network security”, 5th Edition, Pearson Publication, ISBN 0133354695, 2014.
2. Charles P.Pfleeger (Consulting Group Pfleeger), Shari Lawrence(RAND Corporation Pfleeger), “Security in Computing”, 4th Edition, Prentice Hall, ISBN 978-0-13-239077-4, 2012.

OUTCOMES :

Students who complete this course will be able to

- Identify the various threats and vulnerabilities
- Get familiarized on the concept of cryptography
- Examine the issues related to administration security, physical security, and program security.
- Describe the requirements and mechanisms for identification and authentication.
- Determine appropriate mechanisms for protecting information
- Address the design principles and evaluation criteria for database management systems security.

ITC6201 CLOUD COMPUTING TECHNOLOGIES

L	T	P	C
3	0	0	3

OBJECTIVES :

- To gain understanding of the basic concepts of cloud computing.
- To learn various types of cloud services, technologies and service providers.
- To know the design challenges of cloud infrastructure.
- To have knowledge about different programming models and cloud software.
- To understand the privacy and security issues in cloud environments.

MODULE I CLOUD COMPUTING BASICS 08

Introduction to Cloud Computing – Cloud computing reference model- Essential Characteristics - Benefits and challenges of cloud computing- Cloud Delivery Models - Deployment models -Cloud computing vendors.

MODULE II CLOUD COMPUTING TECHNOLOGY 10

Virtualization-Types of virtualization-Virtualization and cloud computing- Client- thin, thick, mobile clients- Cloud Providers and Consumers-Various Cloud Services- Accessing the Cloud- Frameworks- AJAX, Python- Web Hosting Services- Web Applications- Web API's and Web Browsers.

MODULE III CLOUD INFRASTRUCTURE 09

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development– Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

MODULE IV PROGRAMMING MODEL 10

Map Reduce programming model - Map reduce and extensions - Relational operations – Parallel Efficiency of Map Reduce- Cloud File Systems - GFS and HDFS –Cloud platforms in Industry – Google App Engine, Amazon AWS- Cloud Software Environments -Eucalyptus, Open Nebula.

MODULE V SECURITY IN CLOUD 08

Cloud security fundamentals- Privacy and Security in cloud - Software-as-a-Service Security Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

Theory 45

REFERENCES :

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach “ , McGraw-Hill, 2010.
2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O'Reilly, 2009.
4. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “Cloud Computing Principles and Paradigms” John Wiley & Sons, Inc Publications, 2011.
5. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, “Mastering Cloud Computing”, McGraw-Hill Education Private Ltd.,2013.
6. Tim Malhar, S.Kumaraswammy, Shahed Latif ,”Cloud Security & Privacy”, O’Reilly media , 2009.

OUTCOMES :

Students who complete this course will be able to

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Discuss the cloud technologies including virtualization and web based technologies.
- Explain the cloud file systems and their applications in industry.
- Explain the core issues of cloud computing such as security, privacy and interoperability

SINGLE CREDIT ELECTIVE COURSES

CSCY071	WIRELESS NETWORK PROGRAMMING	L	T	P	C
		0.5	0	1	1

OBJECTIVES :

- To gain knowledge on the programming structure
- To learn the graph concepts
- To have an exposure on the implementation of sensor networks
- To address the programming models
- To gather knowledge on the link layer protocols
- To acquire information on the issues related to flooding

TOPICS

Data structures for sensor computing – general structure of programming – Importance of graph concepts in sensor programming-Programming challenges in sensor networks - structural characteristics and properties – sensor network stack – Synchronization-Programming with link layer protocols - ARQ protocol – transmitter role – naming and addressing – algorithms – flooding – tracking.

L – 8; P – 15

REFERENCES :

1. S. Sitharama Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, “Fundamentals of sensor network programming: applications and technology”, John Wiley & sons, ISBN 9780470890158, 2011.

OUTCOMES :

Students who complete this course will be able to

- Know the programming fundamentals of sensor computing
- Get familiarized with sensor network characteristics and stack
- Identify the programming models of sensor networks and issues related to it
- Implement the algorithms related to sensor concepts
- Know the issues related to flooding
- Explore the importance of graph concepts in network programming

CSCY072 CLOUD COMPUTING PROGRAMMING

L	T	P	C
0.5	0	1	1

OBJECTIVES :

- To explore the basic cloud architecture.
- To analyze the application need and design an infrastructure.
- To extend the cloud capacity understanding the different loop holes.
- To learn the implementation of cloud services
- To comprehend the Google web services
- To get expose to cloud security

TOPICS

Design a cloud environment in stimulator-resource management-energy management in stimulated environment-Abstraction and virtualization-capacity planning-Google web service-Amazon web service-Microsoft cloud service-Manage cloud-cloud security. Moving applications to cloud-cloud-based storage.

L – 8; P – 15

REFERENCES :

1. Barrie Sosinsky" Cloud Computing Bible", Wiley India Pvt. Limited, ISBN: 978-0-470-90356-8, 2011.
2. Mark Chu-Carroll "Code in the Cloud: Programming Google App Engine" Pragmatic Bookshelf, ISBN: 1934356638, 2011.

OUTCOMES :

Students who complete this course will be able to

- Design a cloud infrastructure based on different platforms.
- Compare the different cloud services provided by different cloud provider.
- Constitute the basic necessities when building an infrastructure for dynamic applications
- Illustrate the importance of energy management in stimulated environment
- Develop real time applications using cloud services
- Explore the issues in cloud security

CSCY073 BIG DATA PROGRAMMING

L	T	P	C
0.5	0	1	1

OBJECTIVES :

- To illustrate the fundamentals of programming in classes functions and invoking methods.
- To learn how to create a package and interfaces using programming tools.
- To solve the problem using Big Data programming tools.
- To gain the knowledge of designing Big data environment
- To explore the concepts of Map reduce.
- To learn the configuration of other tools supported for Big data

TOPICS

Meet hadoop – MapReduce – Hadoop File System-Configuration API – Configuring the Development Environment – Writing a unit test – Running on a cluster – tuning a job – Mapreduce work flows – how MapReduce Works

L – 8; P – 15

REFERENCES :

1. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'Reilly, ISBN: 978-1-449-31152-0, 2012.

OUTCOMES :

Students who complete this course will be able to

- Design and analyze the real time problems using Hadoop.
- Create an environment to interact with users
- Configure the big data infrastructure.
- Demonstrate the concepts with processing tools.
- Develop a simple program for solving the problems using big data tools
- Apply Big data concepts into real world applications.

CSCY074 VISUAL SYSTEMS PROGRAMMING

L	T	P	C
0.5	0	1	1

OBJECTIVES :

- To introduce the concepts of visual programming.
- To explore the Visual Basic's Integrated Development Environment (IDE)
- To enable the students to develop programs and simple application using Visual C++
- To learn the basics of .NET Framework
- To become familiar with Windows Programming
- To get expose to Structured Query Language

TOPICS

Programming with Visual C++ 2008: The .NET Framework – Writing C++ Applications – Learning Windows Programming - Using the IDE-Windows Programming Basics –Using Windows Forms-The Document/View Concept in MFC – Creating MFC Applications. Working with Menus and Toolbars– Elements of a Menu –Drawing in a Window:– The Drawing Mechanism in Visual C++-Database Management with Microsoft ODBC – Structured Query Language – MFC ODBC classes – sample database applications – filter and sort strings – DAO concepts – displaying database records in scrolling view – Threading – VC++ Networking issues – Winsock – building a web client – Internet Information Server – ISAPI server extension.

L – 8; P – 15

REFERENCES :

1. Julian Templeman, "Microsoft Visual C++/CLI Step by Step", 1st Edition, Microsoft Press, ISBN: 978-0735675179, 2013.
2. Ivor Horton, "Beginning Visual C++", 1st Edition, Wroz, ISBN: 978-0470500880, 2010.

OUTCOMES :

Students who complete this course will be able to

- Apply visual programming to software development by designing projects with menus and submenus
- Implement SDI and MDI applications using forms, dialogs, and other types of GUI components.

- Design and deploy applications using visual C++ programming
- Develop real time applications using Windows Programming
- Comprehend the issues relating to VC++ Networking
- Develop applications in the .NET Framework

CSCY075 OPEN SOURCE TOOLS

L	T	P	C
0.5	0	1	1

OBJECTIVES :

- To introduce to Open Source Ecosystem
- To Create awareness on IPR issues, Licensing considerations
- To discuss concepts of Open Web and its role in Open Source Development
- To introduce varied opens source tools for productivity and development
- To become familiar with data analytics
- To study about the significance of FOSS tools for personal use.

TOPICS

Open Source Eco-system-IPR and Open Source-Licensing : GNU GPL, LGPL, BSD, CPL, Creative Commons-Open Web-GitHub-FOSS Tools for Personal (Individual Use)-FOSS Tools for Small Teams (Limited Users)-FOSS Tools for Corporate Usage-Open Source Productivity and Development Tools in Vogue-Domain Specific Open Source Tools (Networking, Data Analytics, Software Engineering, Database Management etc)

L – 8; P – 15

REFERENCES :

1. Sandeep Koranne, “Handbook of Open Source Tools”, 1st Edition, Springer, 2011.

OUTCOMES :

Students who complete this course will be able to,

- Appreciate the significance of Open Source tools
- Comprehend the process, issues and considerations related to IPR, Licensing etc.
- Work with Open Web concepts, Github Environments etc
- Use varied Open Source tools for different productivity and development tasks
- Analyze domain specific Open Source tools
- Develop applications using FOSS tools

GENERAL ELECTIVES

GECY101 PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

The objectives of the course would be to make the students

- Learn to e valuate and choose an optimal project and build a project profile.
- Attain knowledge on risk identification and risk analysis
- Gain insight into a project plan and components
- Familiar with various gamut of technical analysis for effective project implementation
- Learn to apply project management techniques to manage resources.

MODULE I INTRODUCTION & PROJECT INITIATION 09

Introduction to project and project management - projects in contemporary organization – The project life cycle - project initiation - project evaluation methods & techniques - project selection criteria - project profile.

MODULE II RISK ANALYSIS 09

Sources of risk: project specific - competitive - industry specific - market and international risk – perspectives of risk – risk analysis: sensitivity analysis - scenario analysis - breakeven analysis - simulation analysis - decision tree analysis – managing/mitigating risk – project selection under risk.

MODULE III PROJECT PLANNING & IMPLEMENTATION 09

Project planning – importance – functions - areas of planning - project objectives and policies - steps in planning process - WBS – capital requirements - budgeting and cost estimation - feasibility analysis - creation of project plan – project implementation: pre-requisites - forms of project organization

MODULE IV TECHNICAL ANALYSIS 09

Technical analysis for manufacturing/construction/infrastructure projects – process/technology - materials and inputs - product mix - plant capacity – plant location and site selection – plant layout - machinery and equipment – structures

and civil works – schedule of project implementation – technical analysis for software projects.

MODULE V PROJECT MANAGEMENT TECHNIQUES 09

Project scheduling - network construction – estimation of project completion time – identification of critical path - PERT & CPM – crashing of project network - complexity of project scheduling with limited resources - resource allocation - resource leveling – resource smoothing – overview of project management software.

Total Hours: 45

REFERENCES:

1. Projects: Planning, Analysis, Financing, Implementation and Review, Prasanna Chandra, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
2. Project Management and Control, Narendra Singh, Himalaya Publishing, New Delhi, 2015.
3. A Management Guide to PERT/CPM, Jerome, D. Weist and Ferdinand K. Levy, Prentice Hall of India, New Delhi, 1994.

OUTCOMES:

On successfully completing this course, the student will be able to:

- Evaluate & select a project as well as develop a project profile.
- Identify various risks associated with the project and manage it effectively.
- Prepare a detailed project plan addressing its components.
- Perform technical analysis for effective project implementation
- Apply project management techniques for maximizing resource utilization.

GECY102 SOCIETY, TECHNOLGY & SUSTAINABILITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To aware of new technologies through advances in Science and Engineering.
- To make them realise the profound impact on society.
- To understand the ethical issues raised by technological changes and its effect on society.
- To introduce students a broad range of perspectives on the adoption and use of technologies.
- To make them realize the need of sustainability in the context of emerging technologies.

MODULE I TECHNOLOGY AND ITS IMPACTS 09

Origin and evolution of technologies – Nature of technology- Innovation – Historical Perspective of technology – Sources of technological change - Co-evolution of technology and economy – Scientific knowledge and technological advance – Science and Engineering aspects of Technology – Impact on the Society – Social and Ethical Issues associated with technological change – Social and environmental consequences - Impact of technological change on human life – Technology and responsibility – Technology and social justice.

MODULE II TECHNOLOGY AND ITS ADVANCEMENT 09

Sociological aspects of technology – Ethics and technology – Technology and responsibility – International Economics, Globalisation and Human Rights – Sustainability and Technology – Population and environment - Technology, Energy and Environment – Organisations and technological change.

MODULE III SOCIETY AND TECHNOLOGY 09

Impact of technologies on contemporary society – Role of society in fostering the development of technology – Response to the adaption and use of technology – Impact of technology on developer and consumers – Technological change and globalisation.

MODULE IV IMPACT OF A SPECIFIC TECHNOLOGY ON HUMAN WELFARE 09

Impact of the following technologies on Human life – Medical and Biomedical – Genetics Technology – Electronics and Communications – Electronic media

Technology – Information Systems Technology – Nanotechnology – Space Technology and Energy Technology.

MODULE V THE IMPORTANCE OF SUSTAINABILITY 09

Sustainability – A brief history – Concepts and contexts for sustainability – Ecological imbalance and biodiversity loss – Climate change – Population explosion. Industrial ecology – systems approach to sustainability – Green engineering and technology- sustainable design- sustainable manufacturing- Green consumer movements – Environmental ethics – Sustainability of the planet Earth – Future planning for sustainability.

Total Hours: 45

REFERENCES:

1. Volti Rudi, “Society and Technology Change”, 6th Edition, Worth publishers Inc, USA, 2009.
2. Arthur W.A, “The nature of Technology: What it is and how it evolves”, Free Press, NY, USA, 2009.
3. Winston M and Edelbach R, “Society, Ethics and Technology”, 3rd Edition, San Francisco, USA, 2005.
4. Martin A.A Abraham, “Sustainability Science and Engineering: Defining Principles”, Elsevier Inc, USA, 2006.
5. R.V.G.Menon, “Technology and Society”, Pearson Education, India, 2011.

OUTCOMES:

At the end of this course, the students will be able to

- Understand the benefits of modern technology for the well-being of human life.
- Connect sustainability concepts and technology to the real world challenges.
- Find pathway for sustainable society.

GECY103 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

OBJECTIVES:

- Expose the history and foundations of artificial intelligence.
- Showcase the complexity of working on real time problems underlying the need for intelligent approaches.
- Illustrate how heuristic approaches provide a good solution mechanism.
- Provide the mechanisms for simple knowledge representation and reasoning.
- Highlight the complexity in working with uncertain knowledge.
- Discuss the current and future applications of artificial intelligence.

MODULE I HISTORY AND FOUNDATIONS 08

History – Scope – Influence from life – Impact of computing domains - Agents in environments - Knowledge representation – Dimensions of Complexity – Sample application domains – Agent structure.

MODULE II SEARCH 10

Problem solving as search – State spaces – Uninformed Search – Heuristic search – Advanced search – Constraint satisfaction - Applications.

MODULE III KNOWLEDGE REPRESENTATION AND REASONING 10

Foundations of knowledge representation and reasoning, representing and reasoning about objects, relations, events, actions, time, and space predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

MODULE IV REPRESENTING AND REASONING WITH UNCERTAIN KNOWLEDGE 08

Probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, sample applications.

MODULE V CASE STUDY AND FUTURE APPLICATIONS 09

Design of a game / Solution for problem in student's domain. Natural Language processing, Robotics, Vehicular automation – Scale, Complexity, Behaviour – Controversies.

Total Hours: 45

TEXT BOOK:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2010.
2. David Poole, Alan Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
3. Nils J. Nilsson, The Quest for Artificial Intelligence, Cambridge University Press, Online edition, 2013.
4. Keith Frankish, William M. Ramsey (eds) The Cambridge Handbook of Artificial Intelligence, Cambridge University Press, 2014.

OUTCOMES:

Students who complete this course will be able to

- Discuss the history, current applications, future challenges and the controversies in artificial intelligence.
- Apply principle of AI in the design of an agent and model its actions.
- Design a heuristic algorithm for search problems.
- Analyze and represent the fact using logic for a given scenario
- Represent uncertainty using probabilistic models
- Develop a simple game or solution using artificial intelligence techniques.

GECY104 GREEN COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To focus on the necessity of green computing technology.
- To expose to various issues with information technology and sustainability.
- To attain knowledge on the technologies for enabling green cloud computing.
- To elaborate on the energy consumption issues
- To illustrate a Green and Virtual Data Center
- To develop into a Green IT Technologist.

MODULE I INTRODUCTION 08

Trends and Reasons to Go Green - IT Data Center Economic and Ecological Sustainment - The Growing Green Gap: Misdirected Messaging, Opportunities for Action - IT Data Center “Green” Myths and Realities - PCFE Trends, Issues, Drivers, and Related Factors - Green Computing and Your Reputation- Green Computing and Saving Money- Green Computing and the Environment

MODULE II CONSUMPTION ISSUES 10

Minimizing power usage – Cooling - Electric Power and Cooling Challenges - Electrical – Power -Supply and Demand Distribution - Determining Energy Usage - From Energy Avoidance to Efficiency - Energy Efficiency Incentives, Rebates, and Alternative Energy Sources - PCFE and Environmental Health and Safety Standards- Energy-exposed instruction sets- Power management in power-aware real-time systems.

MODULE III NEXT-GENERATION VIRTUAL DATA CENTERS 09

Data Center Virtualization - Virtualization beyond Consolidation - Enabling Transparency - Components of a Virtual Data Center - Datacenter Design and Redesign - Greening the Information Systems - Staying Green- Building a Green Device Portfolio- Green Servers and Data Centers- Saving Energy

MODULE IV TECHNOLOGIES FOR ENABLING GREEN AND VIRTUAL DATA CENTERS 08

Highly Effective Data Center Facilities and Habitats for Technology - Data Center Electrical Power and Energy Management - HVAC, Smoke and Fire Suppression

- Data Center Location - Virtual Data Centers Today and Tomorrow - Cloud Computing, Out-Sourced, and Managed Services.

MODULE V SERVERS AND FUTURE TRENDS OF GREEN COMPUTING 10

Server Issues and Challenges - Fundamentals of Physical Servers - Types, Categories, and Tiers of Servers - Clusters and Grids - Implementing a Green and Virtual Data Center - PCFE and Green Areas of Opportunity- 12 Green Computer Companies- What's in Green computer science-Green off the Grid aimed for data center energy evolution-Green Grid Consortium- Green Applications- Green Computing Making Great Impact On Research

Total Hours: 45

REFERENCES:

1. Bud E. Smith,"Green Computing Tools and Techniques for Saving Energy, Money, and Resources", Taylor & Francis Group, CRC Press, ISBN-13: 978-1-4665-0340-3, 2014.
2. Jason Harris, "Green Computing and Green IT Best Practices, On Regulations and Industry Initiatives, Virtualization and power management, materials recycling and Tele commuting, Emereo Publishing .ISBN-13: 978-1-9215-2344-1,2014.
3. Ishfaq Ahmed & Sanjay Ranka, "Handbook of Energy Aware and Green Computing", CRC Press, ISBN: 978-1-4665-0116-4, 2013.
4. Kawahara, Takayuki, Mizuno, "Green Computing with Emerging Memory", Springer Publications, ISBN:978-1-4614-0811-6, 2012
5. Greg Schulz, "The Green and Virtual Data Center", CRC Press, ISBN-13:978-1-4200-8666-9, 2009.
6. Marty Poniatowski, "Foundation of Green IT: Consolidation, Virtualization, Efficiency, and ROI in the Data Center", Printice Hall, ISBN: 9780-1-3704-375-0, 2009.

OUTCOMES:

Students who complete this course will be able to

- Demonstrate issues relating to a range of available technologies, systems and practices to support green computing.
- Select appropriate technologies that are aimed to reduce energy consumption.
- Address design issues needed to achieve an organizations' green

computing objectives.

- Analyze the functionality of Data Centers.
- Critically evaluate technologies and the environmental impact of computing resources for a given scenario.
- Compare the impact of Green Computing with other computing techniques.

GECY105 GAMING DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

- To master event-based programming
- To learn resource management as it relates to rendering time, including level-of-detail and culling.
- To become familiar with the various components in a game or game engine.
- To explore leading open source game engine components.
- To become familiar of game physics.
- To be compatible with game animation.

MODULE I INTRODUCTION **09**

Magic Words – What Skills Does a Game Designer Need? – The Most Important Skill -The Five Kinds of Listening-The Secret of the Gifted.

MODULE II THE DESIGNER CREATES AN EXPERIENCE **09**

The Game Is Not the Experience -Is This Unique to Games? -Three Practical Approaches to Chasing Rainbows -Introspection: Powers, Perils, and Practice -Dissect Your Feelings -Defeating Heisenberg -Essential Experience.

MODULE III THE EXPERIENCE IN THE PLAYER MIND AND GAME MECHANICS **08**

Modeling – Focus -Empathy – Imagination – Motivation – Space – Objects, Attributes, and States – Actions – Rules.

MODULE IV GAMES THROUGH AN INTERFACE **09**

Breaking it Down – The Loop of Interaction – Channels of Information – Other Interface.

MODULE V BALANCED GAME MECHANICS **10**

Balance – The Twelve Most Common Types of Game Balance – Game Balancing Methodologies - Balancing Game Economies.

Total Hours: 45

REFERENCES:

1. Jesse Schell, "The Art of Game Design: A Book of Lenses", 2nd Edition ISBN-10: 1466598646, 2014.
2. Ashok Kumar, Jim Etheredge, Aaron Boudreaux, “Algorithmic and Architectural Gaming Design: Implementation and Development", 1st edition, Idea Group, U.S ISBN-10: 1466616342, 2012.
3. Katie Salen Tekinba, Melissa Gresalfi, Kylie Peppler, Rafi Santo, "Gaming the System - Designing with Gamestar Mechanic" MIT Press , ISBN-10: 026202781X, 2014.
4. James M. Van Verth, Lars M. Bishop "Essential Mathematics for Games and Interactive Applications", Third Edition, A K Peters / CRC Press, ISBN-10: 1482250926, 2015.

OUTCOMES:

Students who complete this course will be able to

- Realize the basic history and genres of games
- Demonstrate an understanding of the overall game design process
- Explain the design tradeoffs inherent in game design
- Design and implement basic levels, models, and scripts for games
- Describe the mathematics and algorithms needed for game programming
- Design and implement a complete three-dimensional video game

GECY106 SOCIAL COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To create original social applications, critically applying appropriate theories and effective practices in a reflective and creative manner.
- To critically analyze social software in terms of its technical, social, legal, ethical, and functional features or affordances.
- To encourage the development of effective communities through the design, use, and management of social software.
- To give students with a base of knowledge and advances for them to critically examine existing social computing services.
- To plan and execute a small-scale research project in social computing in a systematic fashion.
- To become familiar with the concept of computational thinking.

MODULE I BASIC CONCEPTS 09

Networks and Relations: Relations and Attributes, Analysis of Network Data, Interpretation of network data -New Social Learning – Four Changes that Shift Work - Development of Social Network Analysis: Sociometric analysis and graph theory, Interpersonal Configurations and Cliques – Analysing Relational Data.

MODULE II SOCIAL LINK 09

Individual Actors, Social Exchange Theory, Social Forces, Graph Structure, Agent Optimization Strategies in Networks – Hierarchy of Social Link Motivation- Social Context.

MODULE III SOCIAL MEDIA 08

Trends in Computing – Motivations for Social Computing – Social Media: Social relationships, Mobility and Social context – Human Computation – Computational Models- Business use of social Media.

MODULE IV SOCIAL INFORMATION FILTERING 09

Mobile Location Sharing – Location based social media analysis – Social Sharing and Social Filtering – Automated recommender Systems – Traditional and Social Recommender Systems.

MODULE V SOCIAL NETWORK STRATEGY 10

Application of Topic Models – Opinions and Sentiments – Recommendation Systems – Language Dynamics and influence in online communities – Psychometric analysis – Case Study: Social Network Strategies for surviving the zombie apocalypse.

Total Hours: 45

REFERENCES:

1. Tony Bingham, Marcia Conner, “The New Social Learning, Connect. Collaborate. Work”, 2nd Edition, ATD Press, ISBN-10:1-56286-996-5, 2015.
2. Nick Crossley, Elisa Bellotti, Gemma Edwards, Martin G Everett, Johan Koskinen, Mark Tranmer, “Social Network Analysis for Ego-Nets”, SAGE Publication, 2015.
3. Zafarani, Abbasi and Liu, Social Media Mining: An Introduction, Cambridge University Press, 2014.
4. Christina Prell, “Social Network Analysis: History, Theory and Methodology”, 1st Edition, SAGE Publications Ltd, 2012.
5. John Scott, “Social Network Analysis”, Third Edition, SAGE Publication, 2013.
6. Jennifer Golbeck, “Analyzing the Social Web”, Elsevier Publication, 2013.
7. Huan Liu, John Salerno, Michael J. Young, “Social computing and Behavioral Modeling”, Springer Publication, 2009.

OUTCOMES:

Students who complete this course will be able to

- Realize the range of social computing applications and concepts.
- Analyze data left after in social media.
- Recognize and apply the concepts of computational models underlying social computing.
- Take out simple forms of social diagnostics, involving network and language models, applying existing analytic tools on social information.
- Evaluate emerging social computing applications, concepts, and techniques in terms of key principles.
- Design and prototype new social computing systems.

GECY107 SOFT COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES:

The aim of the course is to

- Enumerate the strengths and weakness of soft computing
- Illustrate soft computing methods with other logic driven and statistical method driven approaches
- Focus on the basics of neural networks, fuzzy systems, and evolutionary computing
- Emphasize the role of euro-fuzzy and hybrid modeling methods
- Trace the basis and need for evolutionary computing and relate it with other soft computing approaches

MODULE I SOFT COMPUTING - BASICS 06

Soft computing – Hard Computing – Artificial Intelligence as the basis of soft computing – Relation with logic driven and statistical method driven approaches- Expert systems – Types of problems: Classification, Functional approximation, Optimizations – Modeling the problem – Machine Learning – Hazards of Soft Computing – Current and future areas of research

MODULE II ARTIFICIAL NEURAL NETWORK 12

Artificial Neuron – Multilayer perceptron – Supervised learning – Back propagation network –Types of Artificial Neural Network: Supervised Vs Un Supervised Network – Radial basis function Network – Self Organizing Maps – Recurrent Network – Hopfield Neural Network – Adaptive Resonance Theory – Issues in Artificial Neural Network – Applications

MODULE III FUZZY SYSTEMS 09

Fuzzy Logic – Membership functions – Operators – Fuzzy Inference systems – Other sets: Rough sets, Vague Sets – Fuzzy controllers - Applications

MODULE IV NEURO FUZZY SYSTEMS 09

Cooperative Neuro fuzzy systems – Neural network driven fuzzy reasoning – Hybrid Neuro fuzzy systems – Construction of Neuro Fuzzy systems: Structure Identification phase, Parameter learning phase – Applications

MODULE V EVOLUTIONARY COMPUTING 09

Overview of evolutionary computing – Genetic Algorithms and optimization –

Genetic Algorithm operators – Genetic algorithms with Neural/Fuzzy systems – Variants of Genetic Algorithms– Population based incremental learning – Evolutionary strategies and applications

Total Hours: 45

TEXTBOOKS:

1. Samir Roy, “Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms”, Pearson, 2013
2. Anupam Shukla, Ritu Tiwari and Rahul Kala, “Real life applications of Soft Computing”, CRC press, 2010.
3. Fakhreddine O. Karray, “Soft Computing and Intelligent Systems Design: Theory, Tools and Applications”, Pearson, 2009

OUTCOMES:

At the end of the course the students will be able to

- Enumerate the theoretical basis of soft computing
- Explain the fuzzy set theory
- Discuss the neural networks and supervised and unsupervised learning networks
- Demonstrate some applications of computational intelligence
- Apply the most appropriate soft computing algorithm for a given situation

GECY108 EMBEDDED SYSTEM PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the design of embedded computing systems with its hardware and software architectures.
- To describe entire software development lifecycle and examine the various issues involved in developing software for embedded systems.
- To analyze the I/O programming and Embedded C coding techniques
- To equip students with the software development skills necessary for practitioners in the field of embedded systems.

MODULE I INTRODUCTION OF EMBEDDED SYSTEM 09

Embedded computing – characteristics and challenges – embedded system design process – Overview of Processors and hardware units in an embedded system – Compiling, Linking and locating – downloading and debugging – Emulators and simulators processor – External peripherals – Memory testing – Flash Memory.

MODULE II SOFTWARE TECHNOLOGY 09

Software Architectures, Software development Tools, Software Development Process Life Cycle and its Model, Software Analysis, Design and Maintenance.

MODULE III INPUT/OUTPUT PROGRAMMING 09

I/O Instructions, Synchronization, Transfer Rate & Latency, Polled Waiting Loops, Interrupt – Driven I/O, Writing ISR in Assembly and C, Non Maskable and Software Interrupts

MODULE IV DATA REPRESENTATION IN EMBEDDED SYSTEMS 09

Data representation, Twos complement, Fixed point and Floating Point Number Formats, Manipulating Bits in -Memory, I/O Ports, Low level programming in C, Primitive data types, Arrays, Functions, Recursive Functions, Pointers, Structures & Unions, Dynamic Memory Allocation, File handling, Linked lists, Queues, Stacks.

MODULE V EMBEDDED C 09

Embedded Systems programming in C – Binding & Running Embedded C program in Keil IDE – Dissecting the program - Building the hardware. Basic techniques for reading & writing from I/O port pins – switch bounce - LED Interfacing using Embedded C.

Total Hours: 45

REFERENCES:

1. Marilyn Wolf, "Computers as components ", Elsevier, 2012.
2. Qing Li and Carolyn Yao, "Real-Time Concepts for Embedded Systems", CMP Books, 2003.
3. Daniel W. Lewis, "Fundamentals of embedded software where C and assembly meet", Pearson Education
4. Michael Bass, "Programming Embedded Systems in C and C++", Oreilly, 2003.

OUTCOMES:

On completion of this course the student will be able to

- Design the software and hardware components in embedded system
- Describe the software technology
- Use interrupt in effective manner
- Use keil IDE for programming
- Program using embedded C for specific microcontroller
- Design the embedded projects

GECY109 PRINCIPLES OF SUSTAINABLE DEVELOPMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

- To impart knowledge in the concepts and dimensions of sustainable development.
- To gain knowledge on the framework for achieving sustainability.

MODULE I CONCEPT OF SUSTAINABLE DEVELOPMENT 09

Environment and Development - Population poverty and Pollution – Global and Local environmental issues – Resource Degradation- Greenhouse gases – Desertification-industrialization – Social insecurity, Globalization and environment. History and emergence of the concept of sustainable development-Objectives of Sustainable Development.

MODULE II COMPONENTS AND DIMENSIONS OF SUSTAINABLE DEVELOPMENT 09

Components of Sustainability – Complexity of growth and equity – Social economic and environmental dimensions of sustainable development – Environment – Biodiversity – Natural – Resources – Ecosystem integrity – Clean air and water – Carrying capacity – Equity, Quality of Life, Prevention, Precaution – Preservation and Public Participation Structural and functional linking of developmental dimensions.

MODULE III FRAMEWORK FOR ACHIEVING SUSTAINABILITY 09

Operational guidelines – interconnected prerequisites for sustainable development Empowerment of Women, children, Youth, Indigenous People, Non-Governmental Organizations Local Authorities, Business and industry – Science and Technology for sustainable development – performance indicators of sustainability and assessment mechanism – Constraints and barriers for sustainable development.

MODULE IV SUSTAINABLE DEVELOPMENT OF SOCIO ECONOMIC SYSTEMS 09

Demographic dynamics of sustainability – Policies for socio-economic development – Strategies for implementing eco-development programmes Sustainable development through trade – Economic growth – Action plan for implementing sustainable development – Urbanization and sustainable Cities – Sustainable Energy and Agriculture – sustainable livelihoods.

MODULE V SUSTAINABLE DEVELOPMENT AND INTERNATIONAL RESPONSE 09

Role of developed countries in the development of developing countries – international summits – Stockholm to Johannesburg – Rio principles – Agenda-Conventions – Agreements – Tokyo Declaration – Doubling statement – Tran boundary issues integrated approach for resources protection and management

Total Hours: 45

REFERENCES:

1. Sayer J. and Campbell, B., The Science of Sustainable Development: Local Livelihoods and the Global environment - Biological conservation restoration & Sustainability, Cambridge university Press, London, 2003.
2. M.K. Ghosh Roy. and Timberlake, Sustainable Development, Ane Books Pvt. Ltd, 2011.
3. Mackenthun K.M., Concepts in Environmental Management, Lewis Publications London, 1999.
4. APJ Abdul Kalam and Srijan Pal Singh, Target 3 Billion: Innovative Solutions Towards Sustainable Development, Penguin India, 2011

OUTCOMES:

At the end of the course the student will be able to

- Describe the concepts of sustainable development
- Define the components and dimensions of sustainable development
- Outline the Frame work for achieving sustainability.
- State the policies and strategies for implementing sustainable development for Socio economic programmes.
- Examine the role of developed countries in sustainable development.

GECY110	QUANTITATIVE TECHNIQUES IN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVE:

To impart knowledge on

- Concepts of operations research
- Inventory control in production management
- Financial management of projects
- Decision theory and managerial economics

MODULE I OPERATIONS RESEARCH 09

Introduction to Operations research – Linear programming – Graphical and Simplex Methods, Duality and Post-Optimality Analysis – Transportation and Assignment Problems

MODULE II PRODUCTION MANAGEMENT 09

Inventory control, EOQ, Quantity Discounts, Safety Stock – Replacement Theory – PERT and CPM – Simulation Models – Quality Control.

MODULE III FINANCIAL MANAGEMENT 09

Working Capital Management – Compound Interest and Present Value methods – Discounted Cash Flow Techniques – Capital Budgeting.

MODULE IV DECISION THEORY 09

Decision Theory – Decision Rules – Decision making under conditions of certainty, risk and uncertainty – Decision trees – Utility Theory.

MODULE V MANAGERIAL ECONOMICS 09

Cost concepts – Break even Analysis – Pricing techniques – Game Theory applications.

Total Hours: 45

REFERENCES:

1. Vohra, N.D. , Quantitative Techniques in Management, Tata McGraw Hill Co., Ltd, New Delhi, 2009.
2. Seehroeder, R.G., Operations Management, McGraw Hill, USA, 2002.
3. Levin, R.I, Rubin, D.S., and Stinsonm J., Quantitative Approaches to Management, McGraw Hill Book Co., 2008.

4. Frank Harrison, E., The Managerial Decision Making Process, Houghton Miffin Co. Boston, 2005.
5. Hamdy A. Taha, Operations Research- An Introduction, Prentice Hall, 2002.

OUTCOME:

At the end of the course, the students will be able to

- Apply the concepts of operations research for various applications
- Create models for inventory control in production management
- Compute the cash flow for a project
- Choose a project using decision theory based on the risk criterion.
- Apply the concepts of managerial economics in construction management

GECY111 PROGRAMMING USING MATLAB & SIMULINK

L	T	P	C
1	0	2	2

OBJECTIVES:

The aim of this course is to:

- Teach students how to mathematically model engineering systems
- Teach students how to use computer tools to solve the resulting mathematical models. The computer tool used is MATLAB and the focus will be on developing and solving models of problems encountered in engineering fields

MODULE I INTRODUCTION TO MATLAB AND DATA PRESENTATION 10

Introduction to MATLAB-Vectors, Matrices -Vector/Matrix Operations & Manipulation- Functions vs scripts- Making clear and compelling plots-Solving systems of linear equations numerically and symbolically.

Lab Experiments

1. Study of basic matrix operations and manipulations.
2. Numerical and symbolical solution of linear equations.

MODULE II ROOT FINDING AND MATLAB PLOT FUNCTION 10

Linearization and solving non-linear systems of equations- The Newton-Raphson method- Integers and rational numbers in different bases- Least squares regression -Curve fitting-Polynomial fitting and exponential fitting.

Lab Experiments

1. Solution of non linear equations using Newton-Raphson method.
2. Determination of polynomial fit and exponential fit for the given data.

MODULE III LINEAR AND NON-LINEAR DIFFERENTIAL EQUATIONS 13

Numerical integration and solving first order, ordinary differential equations (Euler's method and Runge-Kutta) - Use of ODE function in MATLAB- Converting second order and higher ODEs to systems of first order ODEs- Solving systems of higher order ODEs via Euler's method and Runge-Kutta) - Solving single and systems of non-linear differential equations by linearization-Use of the function ODE in MATLAB to solve differential equations - Plot Function –Saving & Painting Plots.

Lab Experiments

1. Solution of fourth order linear differential equations using
    a. Trapezoidal Rule

b. Euler method

2. Solution of fourth order non-linear differential equations using
    a. Modified Euler method
    b. Runge – Kutta method

MODULE IV INTRODUCTION OF SIMULINK 12

Simulink & its relations to MATLAB – Modeling a Electrical Circuit- Modeling a fourth order differential equations- - Representing a model as a subsystem- Programme specific Simulink demos.

Lab Experiments

1. Solution of fourth order non-linear differential equations using simulink.
2. Programme specific experiment based on simulink.

Total Hours (Including Practicals): 45

REFERENCE:

1. Griffiths D V and Smith I M, “Numerical Methods for Engineers”, Blackwell, 1991.
2. Laurene Fausett, “Applied Numerical Analysis Using MATLAB”, Pearson 2008.
3. Moin P, “Fundamentals of Engineering Numerical Analysis”, Cambridge University Press, 2001.
4. Wilson HB, Turcotte LH, Advanced mathematics and mechanics applications using MATLAB”, CRC Press, 1997
5. Ke Chen, Peter Giblin and Alan Irving, “Mathematical Exploration with MATLAB”, Cambridge University Press, 1999.

OUTCOMES:

At the end of this unit students will be able to:

- Use Matlab as a convenient tool for solving a broad range of practical problems in engineering from simple models to real examples.
- Write programs using first principles without automatic use of built-in ones.
- Write programs for solving linear and nonlinear systems, including those arising from boundary value problems and integral equations, and for root-finding and interpolation, including piecewise approximations.
- Be fluent in exploring Matlab’s capabilities, such as using matrices as the fundamental data-storage unit, array manipulation, control flow, script and function m-files, function handles, graphical output.
- Make use of Maltab visual capabilities for all engineering applications.

- An ability to identify, formulate, and solve engineering problems. This will be accomplished by using MATLAB to simulate the solution to various problems in engineering fields

GECY112 JAVA PROGRAMMING

L	T	P	C
1	0	2	2

OBJECTIVES:

- To learn the fundamentals of Java programming such as data types, variables and arrays.
- To study the syntax and necessity of decision making and iterative statements.
- To create a class and invoke the methods.
- To instigate programming in overloading of methods.
- To emphasize the concept of packages.
- To learn the exception handling routines.

MODULE I INTRODUCTION TO JAVA PROGRAMMING 08

History and Evolution of Java – Overview of Java – Data types, variables and arrays – Operators – Control statements.

MODULE II METHODS AND CLASSES 07

Class fundamentals – Declaring objects – Methods – Constructors – Garbage collection – Overloading methods – Constructor overloading – Access control – Inheritance – Packages - Exception handling.

L: 15, P: 30, Total Hours: 15

REFERENCES:

1. Herbert Schildt, “Java The Complete Reference”, 9th Edition, Oracle Press, 2014, ISBN: 978007180855-2.
2. Nicholas S. Williams, **“**Professional Java for Web Applications: Featuring WebSockets, Spring Framework, JPA Hibernate and Spring Security (WROX)”, John Wiley & Sons, 2014, ISBN: 978111865651-8.
3. E Balagurusamy, “Programming with Java”, 5th Edition, Tata Mcgraw Hill, 2014.
4. Yashavant Kanetka**, “**Let Us Java”, 2nd Edition, BPB Publications, 2012**.**

OUTCOMES:

Students who complete this course will be able to

- Implement basic Java programming.
- Create a class and invoke methods for real world problems.

- Construct simple overloading of methods programs.
- Implement various types of inheritance concepts.
- Describe the access control mechanism.
- Handle exception thrown while implementing programming.

GECY113 PYTHON PROGRAMMING

L	T	P	C
1	0	2	2

OBJECTIVES:

- To learn the list and records of python programming.
- To study the control statements and string functions of python.
- To instigate the fundamental python programming.
- To emphasize GUI in python.
- To integrate python with embedded systems.
- To implement programs in python.

MODULE I INTRODUCTION TO PYTHON PROGRAMMING 08

Installation and environment set up – syntax used in python – variable types – operators – Loops – decision making – string functions - formatted files - GUI basics.

MODULE II EMBEDDED PROGRAMMING USING PYTHON 07

Web interface – system tools – script execution context - Motion-triggered LEDs – Python - Arduino prototyping-storing and plotting Arduino data-Remote home monitoring system.

L: 15, P: 30, Total Hours: 15

REFERENCES:

1. Nick Goddard, “Python Programming”, 2nd edition, ISBN: 1533337772, 2016.
2. Pratik Desai, “Python Programming for Arduino”, 1st edition, Packt publishing, 2015, ISBN: 9781783285938.
3. Mark Lutz, Learning Python: Powerful Object-Oriented Programming, 5th Edition, O'Reilly Media, 2013.
4. Richard H. Barnett, Sarah Cox, Larry O'Cull, “Embedded C Programming and the Atmel AVR”, 2nd edition, 2006.
5. Michael Barr, Anthony Massa, “Programming Embedded Systems”, 2nd Edition, O'Reilly Media, 2006.

OUTCOMES:

Students who complete this course will be able to

- Implement date and time function programming using python.

- Write formatted file programming.
- Construct simple python programs.
- Create web interface using python programming
- Develop embedded system with python programming.
- Build Arduino prototype using python programming.

GECY114 INTELLECTUAL PROPERTY RIGHTS (IPR)

L	T	P	C
1	0	0	1

OBJECTIVES:

- To study about Intellectual property rights and its need
- To explore the patent procedure and related issues

MODULE I INTRODUCTION 07

Introduction and the need for intellectual property right (IPR) – IPR in India – Genesis and Development – IPR in abroad – Important examples of IPR – Copyrights, Trademarks, Patents, Designs, Utility Models, Trade Secrets and Geographical Indications – Industrial Designs

MODULE II PATENT 08

Concept of Patent – Product / Process Patents & Terminology – Duration of Patents – Law and Policy Consideration Elements of Patentability –- Patentable Subject Matter – Procedure for Filing of Patent Application and types of Applications – Procedure for Opposition – Revocation of Patents – Working of Patents- Patent Agent – Qualification and Registration Procedure – Patent databases and information system – Preparation of patent documents – Process for examination of patent application- Patent infringement – Recent developments in patent system

Total Hours: 15

REFERENCES

1. B.L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000
2. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
3. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.
4. E. T. Lokganathan, Intellectual Property Rights (IPRs): TRIPS Agreement & Indian Laws Hardcover, 2012
5. Alka Chawla, P N Bhagwati , Law of Copyright Comparative Perspectives 1st Edition, LexisNexis, 2013
6. V. K. Ahuja, Law Relating to Intellectual Property Rights 2nd Edition, LexisNexis, 2nd Edition, 2013

7. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 2015
8. Jatindra Kumar Das, Law of Copyright, PHI Learning, 2015

COURSE OUTCOMES:

Students should be able to

- Identify the various types of intellectual property and their value
- Apply the procedure to file a patent and to deal the related issues
- Search and extract relevant information from various intellectual database