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

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

Regulations 2019
Curriculum and Syllabi

(Amendments updated upto June 2020)

M.Tech.
(Information Technology)

B.S. Abdur Rahman Crescent Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

REGULATIONS 2019
CURRICULUM AND SYLLABI
(Amendments updated upto June 2020)

M.Tech.

INFORMATION TECHNOLOGY

VISION AND MISSION OF THE INSTITUTION

VISION

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

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- 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.

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION AND MISSION

VISION

To be a leader in providing quality education and training in the field of Information Technology at Undergraduate and Postgraduate levels and undertake Research activities thereby contributing to the progress of the country.

MISSION

- To impart quality education and inculcate professionalism to suit the needs of the industries and society.
- To involve graduates in undertaking need based Research activities and disseminate the knowledge to develop entrepreneurial skills.
- To improve the professionalism through extension activities, industrial visits and in-plant training.
- To improve communicate effectively both in documentation and presentation.
- To create awareness of social, economic responsibilities ethically.

PROGRAMME EDUCATIONAL OBJECTIVES

- To impart broad spectrum of knowledge and skill in the analysis, design, implementation and testing of software systems.
- To focus on need based research in different domains relevant to Information Technology and carry out research projects of national and social relevance.
- To provide problem solving capability through IT tools and techniques with adequate hands on experience to meet industry/ societal needs.
- To develop communication, problem solving, team spirit and leadership skills for a successful professional career.
- To impart professional ethics and develop independent and life-long learning skills for the sustainable development.

PROGRAMME OUTCOMES

On completion of the programme, students will be able to:

- Analyze, design, test and implement software systems required for IT industry.
- Apply relevant tools and techniques to solve software problems and undertake research activities.
- Prepare necessary software documentation and present with effective communication skills.
- Manage, organize and lead a team of highly competent Information technologist.
- Practice professional ethics and learn independently throughout the life to contribute for the society and sustainable development.

B.S.ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE & TECHNOLOGY,CHENNAI – 600 048.

REGULATIONS -2019 FOR

M.Tech. / MCA / M.Sc. DEGREE PROGRAMMES

(Under Choice Based Credit System)

1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires **"Programme"** means Post Graduate Degree Programme (M.Tech. / MCA/ M.Sc.)

"Course" means a theory / practical / laboratory integrated theory / mini project / seminar / internship / Project and any other subject that is normally studied in asemester like Advanced Concrete Technology, Electro Optic Systems, Financial Reporting and Accounting,Analytical Chemistry, etc.,

"Institution" means B.S. Abdur Rahman Crescent Institute of Science & Technology.

"Academic Council" means the Academic Council, which is the apex body on all academic matters of B.S. Abdur Rahman Crescent Institute of Science & Technology.

"Dean (Academic Affairs)" means Dean (Academic Affairs) ofB.S. Abdur Rahman Crescent Institute of Science & Technology who administers the academic matters.

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

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

2.0 PROGRAMMES OFFERED AND ADMISSION REQUIREMENTS

2.1 Programmes Offered

The various programmes and their mode of study are as follows:

Degree	Mode of Study
M.Tech.	Full Time
MCA	
M.Sc.	

2.2 ADMISSION REQUIREMENTS

2.2.1 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 clause 3.2 [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.

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

3.0DURATION, ELIGIBILITY AND STRUCTURE OF THE PROGRAMME

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

Programme	Min. No. of Semesters	Max. No. of Semesters
M.Tech.	4	8
MCA (3 years)	6	12
MCA (Lateral Entry)	4	8
MCA (2 years)	4	8
M.Sc.	4	8

3.1.1 Each academic semester shall normally comprise of 90 working days. Semester End Examinations shall follow within 10 days of the last Instructional day.

3.1.2 Medium of instruction, examinations and project report shall be in English.

3.2 ELIGIBLE ENTRY QUALIFICATIONS FOR ADMISSION TO PROGRAMMES

Sl. No.	Name of the Department	Programmes offered	Qualifications for admission
1.	Aeronautical Engineering	M.Tech. (Avionics)	B.E. / B. Tech. (Aeronautical Engineering)
2.	Civil Engineering	M.Tech. (Structural Engineering)	B.E. / B. Tech. (Civil Engineering) / (Structural Engineering)

		M. Tech. (Construction Engineering and Project Management)	B.E. / B. Tech. (Civil Engineering) / (Structural Engineering) / B. Arch.
3.	Mechanical Engineering	M.Tech. (Manufacturing Engineering)	B.E. / B.Tech. (Mechanical / Automobile / Manufacturing / Production / Industrial / Mechatronics / Metallurgy / Aerospace /Aeronautical / Material Science / Marine Engineering)
		M.Tech. (CAD/CAM)	
4.	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 and Drives)	
5.	Electronics and Communication Engineering	M.Tech. (Communication Systems)	B.E. / B.Tech. (EEE/ ECE / E&I / CSE IT / I&C / Electronics / Instrumentation)
		M.Tech. (VLSI and Embedded Systems)	B.E./ B.Tech. (ECE / E&I / I&C / EEE / CSE / IT)
6.	Electronics and Instrumentation Engineering	M.Tech. (Electronics and Instrumentation Engineering)	B.E./ B.Tech. (EIE/ICE/Electronics/ECE/EEE)
7.	Computer Science and Engineering	M.Tech. (Computer Science and Engineering)	B.E. / B.Tech. (CSE/IT/ECE/EEE/EIE/ICE/ Electronics / MCA)
8.	Information Technology	M.Tech. (Information Technology)	B.E. / B.Tech. (IT/CSE/ECE/EEE/EIE/ICE/ Electronics / MCA)

9.	Computer Applications	MCA (3 years)	Bachelor Degree in any discipline with Mathematics as one of the subjects (or) Mathematics at +2 level
		MCA – (Lateral Entry)	B.Sc. Computer Science / B.Sc. Information Technology / BCA
		MCA (2 years)	Bachelor Degree in any discipline with Mathematics as one of the subjects (or) Mathematics at +2 level or B.Sc. Computer Science / B.Sc. Information Technology / BCA
10.	Mathematics	M.Sc. (Actuarial Science)	Any Degree with Mathematics / Statistics as one of the subjects of study
11.	Physics	M.Sc.(Physics)	B.Sc. (Physics / Applied Science / Electronics / Electronics Science / Electronics & Instrumentation)
12.	Chemistry	M.Sc.(Chemistry)	B.Sc. (Chemistry / Applied Science)
13.	Life Sciences	M.Sc. Molecular Biology &Biochemistry	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.Tech. Biotechnology	B.Tech. (Biotechnology / Chemical Engineering) / M.Sc. in any branch of Life Sciences

3.3.STRUCTURE OF THE PROGRAMME

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

i. Core courses
ii. Elective courses
iii. Laboratory oriented core courses
iv. Project work / thesis / dissertation
v. Laboratory Courses
vi. Seminars
vii. Mini Project
viii. Industrial Internship
ix. Value Added Courses
x. MOOC Courses (NPTEL, SWAYAM, etc.,)

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

3.3.3 For the award of the degree, the student has to earn a minimum total credits specified in the curriculum of the respective specialization of the programme.

3.3.4 The curriculum of 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	Range of credits
M.Tech.	74-80
MCA (3 years)	118 - 126
MCA(Lateral Entry)	80 - 85
MCA (2 years)	85 - 90
M.Sc.	77- 82

3.3.5 Credits will be assigned to the courses for all programmes as given below:

- ❖ Onecredit for one lecture period per week or 15 periods of lecture per semester
- ❖ One credit for one tutorial period per week or 15 periods per semester
- ❖ One credit each for seminar/practical session/project of two or three periods per week or 30 periods per semester
- ❖ One credit for four weeks of industrial internship or 160 hours per

semester.

3.3.6 The number of credits the student shall enroll in a non-project semester and project semester is as specified below to facilitate implementation of Choice Based Credit System.

Programme	Non-project semester	Project semester
M.Tech.	9 to 28	18 to 26
MCA	12 to 33	12 to 26
M.Sc.	9 to 32	10 to 26

3.3.7 The student may choose a course prescribed in the curriculum from any department offering that course without affecting regular class schedule. The attendance will be maintained course wise only.

3.3.8 The students shall choose the electives from the curriculum with the approval of the Head of the Department / Dean of School.

3.3.9 Apart from the various elective courses listed in the curriculum for each specialization of programme, the student can choose a maximum of two electives from any other similar programmes across departments, during the entire period of study, with the approval of the Head of the department offering the course and parent department.

3.4.ONLINE COURSES

3.4.1 Students are permitted to undergo department approved online courses under SWAYAM up to 20% of credits of courses in a semester excluding project semester with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

3.4.2 Students shall undergo project related online course on their own with the mentoring of the faculty member.

3.5PROJECT WORK/DISSERTATION

3.5.1 Project work / Dissertation shall be carried out by the student under the supervision of a Faculty member in the department with similar specialization.

3.5.2 A student may however, in certain cases, be permitted to work for the project in an Industry / Research Organization, with the approval of the Head of the Department/ Dean of School. 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 meetings for evaluating the progress.

3.5.3 The timeline for submission of final project report / dissertation is within 30 calendar days from the last Instructional day of the semester in which Project / Dissertation is done.

3.5.4 If a student does not comply with the submission of project report / dissertation on or before the specified timeline he / she is deemed to have not completed the project work / dissertation and shall re-register in the subsequent semester.

4.0CLASS ADVISOR AND FACULTY ADVISOR

4.1 CLASS ADVISOR

A faculty member shall be nominated by the HOD/ Dean of School 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.

4.2 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 / Dean of School of the students shall 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 in every semester.

5.0CLASS COMMITTEE

5.1 A class committee comprising faculty members handling the classes, student representatives and a senior faculty member not handling the courses as chairman will be constituted in every semester:

5.2 The composition of the class committee will be as follows:

i) One senior faculty member preferably not handling courses for the

concerned semester, appointed as chairman by the Head of the Department

ii) Faculty members of all courses of the semester

iii) All the students of the class

iv) Faculty advisor and class advisor

v) Head of the Department – Ex officio member

5.3 The class committee shall meet at least three times during the semester. The first meeting shall be held within two weeks from the date of commencement of classes, in which the nature of continuous assessment for various courses and the weightages for each component of assessment shall be decided for the first and second assessment. The second meeting shall be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

5.4 During these two meetings the student members, shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum and syllabus.

5.5 The third meeting of the class committee, excluding the student members, shall meet within 5 days from the last day of the semester end examination to analyze the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

6.0COURSE COMMITTEE

6.1 Each common theory / laboratorycourse offered to more than one group of students shall have a “Course Committee” comprising all the teachers handling the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending upon whether all the teachers handling the common course belong to a single department or from several departments. The Course Committee shall meet as often as possible to prepare a common question paper, scheme of evaluation and ensure uniform evaluation of the assessment tests and semester end examination.

7.0REGISTRATION AND ENROLLMENT

7.1 The students of first semester shall register and enroll at the time of admission by paying the prescribed fees.

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

7.3 A student can withdraw from an enrolled course at any time before the first assessment test for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

7.4 A student can change an enrolled course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

8.0TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

8.1 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. A student can avail the break of study before the start of first assessment test of the ongoing semester. However the total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 3.1). If any student is debarred for want of attendance or suspended due to any act of indiscipline, it will not be considered as break of study. A student who has availed break of study has to rejoin in the same semester only in the subsequent year. The student availing break of study is permitted to write arrear examinations by paying the prescribed fees.

9.0 MINIMUM REQUIREMENTS TO REGISTER FOR PROJECT / DISSERTATION

9.1 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.	18
MCA (3 years)	45
MCA (Lateral Entry)	22

MCA (2 years)	22
M.Sc.	18

9.2 If the student has not earned minimum number of creditsspecified, 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.

10.0ATTENDANCE

10.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% (for genuine reasons such as medical grounds, representing for 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. The courses in which the student is awarded "I" grade, shall register and redo the course when it is offered next.

10.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in that course to the Class Advisor. The Class Advisor will consolidate and furnish the list of students who have earned less that 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department / Dean of School. Thereupon, the Dean (Academic Affairs) shall announce the names of such students prevented from writing the semester end examination in each course.

10.3 A student who has obtained 'I' grade in all the courses in a semester is not permitted to move to next higher semester. Such student shall redo all the courses of the semester in the subsequent academic year.However he / she is permitted to redo the courses awarded with 'I' grade / arrear in previous semesters. They shall also be permitted to write arrear examinations by paying the prescribed fee.

10.4 A student shall register to redo 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 chosen with the approval of Head of the Department / Dean of School.

11.0REDO COURSES

11.1 A student can register for a maximum of two redo courses per semester in the evening after regular working hours, if such courses are offered by the concerned department. Students may also opt to redo the courses offered during regular semesters, without affecting the regular academic schedule and not exceeding prescribed maximum credits.

11.2 The Head of the Department with the approval of Dean (Academic Affairs) may arrange for the conduct of a few courses in the evening after regular working hours, depending on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

11.3 The number of contact hours and the assessment procedure for any redo course will be the same as those during regular semesters except that there is no provision for any substitute examination and withdrawal from an evening redo course.

12.0ASSESSMENTS AND EXAMINATIONS

12.1 Every theory course shall have a total of three assessments during a semester as given below:

Assessments	Weightageof Marks
Continuous Assessment 1	25%
Continuous Assessment 2	25%
Semester End Examination	50%

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

Every practical course shall have 75% weightage for continuous assessments and 25% for semester end examination. However a student should have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

12.3 For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical component. Grading shall be done for this consolidated mark. Assessment of

theory component shall have a total of three assessments with two continuous assessments having 25% weightage each and semester end examination having50% weightage. The student shall secure a separate minimum of 40% in the semester end theory examination for the award of pass grade. The evaluation of practical component shall be through continuous assessment.

12.4 The components of continuous assessment for theory/practical/laboratory integrated theory courses shall be finalized in the first class committee meeting.

12.5 In the case of Industrial training, the student shall submit a report, which shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research organisation. The weightage for Industry internship reportshall be 60% and 40% for viva voce examination.

12.6 In the case of project work, a committee of faculty members constituted by the Head of the Department will carry out three periodic reviews. Based on the project report submitted by the student, an oral examination (viva voce) shall beconducted as semester end examination by an external examiner approved by Controller of Examinations. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the Viva Voce examination.

12.7 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance shall be considered for grading along with the marks scored in the semester end arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination to award grades and the internal assessment marks secured during the course of study shall not be considered.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end arrear examination for theory component. There shall be no arrear or improvement examination for lab component.

13.0 SUBSTITUTE EXAMINATIONS

13.1 A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of School for that purpose. However there is no substitute examination for semester end examination.

13.2 A student shall apply for substitute exam in the prescribed form to the Head of the Department / Dean of School within a week from the date of assessment test. However the substitute examination will be conducted only after the last working day of the semester and before the semester end examination.

14.0 SUPPLEMENTARY EXAMINATION

14.1 Final Year students can apply for supplementary examination for a maximum of three courses thus providing an opportunity to complete their degree programme. Likewise students with less credit can also apply for supplementary examination for a maximum of three courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three weeks of the declaration of results in both odd and even semester.

15. PASSING, DECLARATION OF RESULTS AND GRADE SHEET

15.1 All assessments of a course shall be made on absolute marks basis. However, the Class Committee without the student members shall meet within 5 days after the semester end examination and analyze the performance of students in all assessments of a course and award letter grades. The letter grades and the corresponding grade points are as follows:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6

E	5
U	0
W	0
I	0
AB	0

"W" denotes withdrawal from the course.

"I" denotes inadequate attendance and hence prevented from appearing for semester end examination

"U" denotes unsuccessful performance in the course.

"AB" denotes absence for the semester end examination.

15.2 A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.

15.3 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department/Dean of School and it shall be declared by the Controller of Examinations.

15.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer scripts of one or more courses, on payment of prescribed feeto the Controller of Examinations. Subsequently the Head of the Department/ Dean of School offered the course shall constitute a revaluation committee consisting of Chairman of the Class Committee as convener, the faculty member of the course and a senior faculty member knowledgeable in that course as members. The committee shall meet within a week to re-evaluate the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

15.5 After results are declared, grade sheets shall be issued to each student, which contains the following details: a) list of courses enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those

courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester.

If C_i, is the number of credits assigned for the i^{th} course and GP_i is the Grade Point in the i^{th} course

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

Where n = number of courses

The Cumulative Grade Point Average (CGPA) is calculated in a similar manner, considering all the courses enrolled from first semester.

“I” and "W" grades are excluded for calculating GPA.

"U", “I”, "AB" and **"W"** grades are excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks is as follows:

Percentage Equivalent of Marks = CGPA X 10

15.6 After successful completion of the programme, the Degree shall be awarded upon fulfillment of curriculum requirements and classification based on CGPA as follows:

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within the minimum prescribed period.
First Class	6.50 and above and completing the programme within a minimum prescribed period plus two semesters.
Second Class	Others

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 period ofstudy and should have completed the P.G. programme within a minimum period (except break of study). To be eligible for First Class, a student should have passed the examination in all the 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 is not considered. The students who do not satisfy the above two conditions shall be classified as second class. For the purpose of classification, the CGPA shall 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.

16.0DISCIPLINE

16.1 Every student is expected to observe disciplined and decorous behaviour both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

16.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action.

17.0 ELIGIBILITY FOR THE AWARD OF THE MASTERS DEGREE

17.1 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.
iii. Enrolled and completed at least one value added course.
iv. Enrollment in at least one MOOC / SWAYAM course (non-credit) before the final semester.

17.2 The award of the degree must have been approved by the Institute.

18.0POWER 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.

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B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY
M.TECH. INFORMATION TECHNOLOGY
CURRICULUM & SYLLABUS, REGULATIONS 2019

SEMESTER I

Sl. No.	Course Code	Course Name	L	T	P	C
1.	MAD 6181	Applied Algebra and Discrete Algorithms	3	1	0	4
2.	CSD 6101	Advanced Computer Architecture	3	0	0	3
3.	CSD 6103	Computer Networks and Management	3	0	0	3
4.	ITD 6101	Advanced Data Structures	3	0	2	4
5.	ITD 6102	Software Development Methodologies	3	0	0	3
6.		Professional Elective	3	0	0	3
7.	ITD 6103	Software Development and Testing Lab	0	0	3	1
		Total Credits				**21**

SEMESTER II

Sl. No.	Course Code	Course Name	L	T	P	C
1.	ITD 6201	Cloud Computing Technology	3	0	0	3
2.	ECD 6201	Research Methodology for Engineers	3	1	0	4
3.	ITD 6202	Machine Learning	3	0	2	4
4.		Professional Electives				9
5.		Value Added Course				-
		Total Credits				**20**

SEMESTER III

Sl. No.	Course Code	Course Name	Credit
1.		Professional Electives	6
2.		General Elective	3
3.	ITD 7101	Internship	1
4.	ITD 7102	Project - Phase I	6
5.		MOOC (Related to Project)	-
		Total Credits	**10 + 6**

SEMESTER IV

Sl. No.	Course Code	Course Name	Credit
1.	ITD 7102	Project - Phase II	18
		Total (Project I & II)	6 + 18 = 24
		Total Credits	**75**

Note:

- Enrollment in Value added course is mandatory for Programme completion.
- Enrollment in MOOC course (noncredit) is mandatory for Phase I Project completion and Project supervisor will act as course coordinator.
- For professional electives students can choose MOOC courses for credit transfer.

Value Added Course: Guidelines

- Any relevant certification course offered by the Institution.
- Any relevant certification course offered by other Institutions / Universities; Bombay IIT(ST);MOOC courses etc.

MOOC courses: Guide lines

- A minimum of one credit MOOC course relevant to project work shall be selected.

Important Note:

- The selection of Value added course and MOOC by students shall be endorsed by Head of the Department.

PROFESSIONAL ELECTIVES

I Semester Electives (3 Credits)

Sl. No.	Course Code	Course Name	L T P C
1.	ITDY 101	Computer Forensics and Information Security	3 0 0 3
2.	ITDY 102	Multimedia Technology & Applications	3 0 0 3
3.	ITDY 103	High Performance Networks	3 0 0 3
4.	ITDY 104	Internetworking with TCP/IP	3 0 0 3

II Semester Electives (9 Credits)

Sl. No.	Course Code	Course Name	L T P C
1.	ITDY 201	Multicore Architectures	3 0 0 3
2.	ITDY 202	Social Network Analysis	3 0 0 3
3.	ITDY 203	Distributed Operating Systems	3 0 0 3
4.	ITDY 204	Applied Cryptography	3 0 0 3
5.	ITDY 205	Wireless Networks	3 0 0 3
6.	ITDY 206	Virtualization Techniques	3 0 0 3
7.	ITDY 207	Web Design & Management	3 0 0 3
8.	ITDY 208	Data Warehousing and Data Mining	3 0 0 3
9.	ITDY 209	Soft Computing	3 0 0 3
10.	ITDY 210	Mobile Computing Technologies	3 0 0 3
11.	ECDY 050	Digital Image Processing	3 0 0 3

III Semester Electives (6 Credits)

Sl. No.	Course Code	Course Name	L	T	P	C
1.	ITDY 111	Deep Learning	3	0	0	3
2.	ITDY 112	Wireless & Mobile Communication	3	0	0	3
3.	ITDY 113	Big Data Computing	3	0	0	3
4.	ITDY 114	Ontology and Semantic Web	3	0	0	3
5.	ITDY 115	Software Project Management	3	0	0	3
6.	ITDY 116	Data Science Analytics	3	0	0	3
7.	ITDY 117	Green Computing Technology	3	0	0	3
8.	ITDY 118	Blockchain Architecture and Use Cases	3	0	0	3
9.	ITDY 119	Big Data Analytics for IoT	3	0	0	3

GENERAL ELECTIVES

Sl. No.	Course Code	Course Title	L	T	P	C
1.	GEDY 101	Project Management	3	0	0	3
2.	GEDY 102	Society, Technology & Sustainability	3	0	0	3
3.	GEDY 103	Artificial Intelligence	3	0	0	3
4.	GEDY 104	Green Computing	3	0	0	3
5.	GEDY 105	Gaming Design	3	0	0	3
6.	GEDY 106	Social Computing	3	0	0	3
7.	GEDY 107	Soft Computing	3	0	0	3
8.	GEDY 108	Embedded System Programming	3	0	0	3
9.	GEDY 109	Principles of Sustainable Development	3	0	0	3
10.	GEDY 110	Quantitative Techniques in Management	3	0	0	3
11.	GEDY 111	Programming using MATLAB & SIMULINK	1	0	2	2
12.	GEDY 112	JAVA Programming	3	0	0	3
13.	GEDY 113	PYTHON Programming	3	0	0	3
14.	GEDY 114	Intellectual Property Rights	1	0	0	1

SEMESTER – I

MAD 6181 APPLIED ALGEBRA AND DISCRETE ALGORITHMS L T P C

(For M Tech CSE and IT) 3 1 0 4

OBJECTIVES: The aim of this course is to

- Make the students familiarize on the concepts of mathematical induction and codes.
- Motivate the students to solve problems applying techniques of logic.
- To have a knowledge on the concepts of Formal languages and Automata theory.
- Familiarize students with basics of graph theory.

  Train the students in applying the basic concepts of Cryptography.

MODULE I INTEGERS, COMPUTER ALGEBRA AND CODES 9+3

Integers – computer algebra versus numerical analysis – sums and products – mathematical induction – Binary, Hexadecimal, ASCII, Morse, Braille, Two out of Five and Hollerith Codes.

MODULE II LOGIC 9+3

Propositional logic–logical connectives – truth tables – normal forms (conjunctive and disjunctive) – solving word problems - predicate logic - universal and existential quantifiers - proof techniques – direct and indirect – proof by contradiction – applications.

MODULE III MODELING, COMPUTATION AND LANGUAGES 9+3

Finite state machines - deterministic and non-deterministic finite state machines - classes of grammars - phrase structure grammar - context sensitive - context-free - regular grammars - formal languages - ambiguity - Turing machines.

MODULE IV GRAPH THEORY 9+3

Multigraphs - applications of graph theory - classes of graphs - subgraphs and morphisms - Hamilton circuits – planar graphs – shortest paths and spanning trees – applications.

MODULE V CIPHERS 9+3

Cryptography - cryptanalysis - substitution and permutation ciphers – block cipher – the play fair cipher – unbreakable ciphers – applications.

L – 45; T – 15; Total Hours : 60

TEXT BOOKS:

1 Hopcraft, J. E, R. Motwani and Ullman, J. D, 'Introduction to Automata theory, Languages and Computation', Narosa publishing House, 4th edition 2006.

2 Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2015.

3 J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, 1997.

REFERENCES:

1 Juraj Hromkovic, Theoretical Computer Science: Introduction to Automata, Computability, Complexity, Algorithmics, Randomization, Communication and Cryptography, Springer, 2003.

2 Darel W. Hardy, Fred Richman, Carol L. Walker, Applied Algebra: Codes, Ciphers and Discrete Algorithms, Second Edition (Discrete Mathematics and Its Applications), CRC Press, New york, 2009.

3 David Gries and Fred B. Schneider, A Logical Approach to Discrete Math, Springer, Edition 3,1993

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

- Authenticate the correctness of the a given statement using mathematical induction.
- Test and analyze the logic of a program.
- Apply the concept of finite state machines and to generate languages.
- Analyze the types of graphs solve problems using the concepts of graph theory.
- Apply encryption and decryption techniques to send messages securely.

ITD 6101 ADVANCED DATA STRUCTURES

L	T	P	C
3	0	2	4

OBJECTIVES:

i. To introduce the concept of data structures through abstract data structures including lists, stacks, queues, sets/maps, trees, and graphs.
ii. To introduce the fundamental concept of data structures and to emphasize the importance of data structures.
iii. To choose the appropriate data structure for a specified application.
iv. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

MODULE I ABSTRACT DATA TYPES **10**

Introduction-The List ADT – Implementation of Lists- Applications of List- The Stack ADT –Stack Model-Implementation of Stacks-Applications of Stack– The Queue ADT – Queue Model-Implementation of Queues– Applications of Queue.

MODULE II TREES **9**

Preliminaries – Binary Trees – Expression Trees - Tree Traversals - Binary Search Trees – AVL Trees – Splay Trees – Top-Down Splay Tree- B Trees – Red-Black Trees -Treaps.

MODULE III HASHING & HEAPS **8**

General idea of Hashing – Hash function – Separate Chaining – Hash Tables without Linked lists – Rehashing - Binary Heap – Applications of Priority Queues – d-Heaps.

MODULE IV SORTING & THE DISJOINT SET CLASS **8**

Insertion Sort – Shell Sort – Heap Sort – Merge Sort – Quick Sort –External Sort-The Disjoint Sets Class – Equivalence Relations – The Dynamic Equivalence Problem – Basic Data Structure – Path Compression.

MODULE V GRAPH ALGORITHMS **10**

Definitions-Representation of Graphs – Topological Sort – Shortest Path Algorithms – Network Flow Problems – Minimum Spanning Tree – Applications of Depth-First Search-Introduction to NP-Completeness-The Class NP-NP-Complete

Problems.

LIST OF EXERCISES

1. Implementation of List, Stack, Queue ADTs using array.
2. Implementation of Singly Linked List.
3. Implementation of Stack & Queue ADT using Linked List.
4. Implementation of Trees.
5. Implementation of Sorting Techniques.
6. Implementation of Dijkstra's Shortest Path First algorithm.
7. Implementation of real-world applications using List, Stack, Queue, Tree & Graph.

Lecture Hours:**45 Hours** **Practical: 30 Hours** **TOTAL: 75 Hours**

TEXT BOOK:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 4th Edition., Addison Wesley, 2014.

REFERENCES:

1. Horowitz, Sahni, Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd edition,Universities Press, 2008.
2. Aaron M. Tanenbaum, Yedidyah Langsam, Moshe J. Augenstein, “Data Structures using C”, Pearson Education, 2011.
3. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles”, 5th Edition, Career Monk Publications, 2016.

OUTCOMES:

On completion of the course, students will be able to:

- Discuss the abstract properties of various data structures such as lists, stacks and queues.
- Demonstrate the working of different types of trees.
- Outline the concepts of hashing and heaps.
- Explain the various sorting techniques and assess the working of disjoint sets class.
- Assess the different techniques employed by various types of graphs.

CSD6101 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

OBJECTIVES :

- To understand the functional requirements and their role in the system design
- To acquire essential knowledge to measure or predict system performance
- To understand the various parameters that contribute to the performance of a computer system and the technology of achieving the best performance through these parameters
- To understand how the memory hierarchy and optimization contribute to the performance of the system
- To understand the approaches in designing a new system through Instruction level parallel processing and to improve the Performance overcoming the hazards-meeting the functionality.
- To understand the data level parallel processing and Vector Processing for performance

PREREQUISITES : Computer Architecture

MODULE I FUNDAMENTALS OF COMPUTER DESIGN **09**

Functional Requirements and architecture - Measuring and reporting performance - Quantitative principles of computer design - Classifying instruction set architecture - Operands and operations for media and signal processing –Graphic processing - Encoding an instruction set - Example architecture - MIPS and TM32.

MODULE II MEMORY HIERARCHY DESIGN **09**

Memory Hierarchy - Cache performance - Reducing cache miss penalty and miss rate - Reducing hit time - Main memory and performance - Memory technology and optimization-Virtual memory and Virtual Machine and protection.

MODULE III INSTRUCTION LEVEL PARALLELISM **09**

Concepts of ILP - Pipelining and hazards –Compiler techniques for exposing ILPDynamic scheduling - Dynamic hardware prediction - Multiple issues -

Hardware based speculation - Limitations of ILP - Case studies: lP6 Micro architecture. Compiler techniques for exposing ILP - Static branch prediction - Static multiple issues: VLIW - Advanced compiler support –Hardware VS software speculation.– Case study: Intel core i7 and ARM Cortex-A8

MODULE IV DATA-LEVEL PARALLELISM 09

Vector Architecture - SIMD Instruction Set Extensions for Multimedia - Graphic Processing Units- Detecting and Enhancing Loop Level Parallelism - Mobile verses Server GPUs - Case Studies

MODULE V THREAD LEVEL PARALLELISM 09

Centralized Symmetric and shared memory Multiprocessor architectures - Performance issues - Distributed Shared Memory architecture- Directory based architecture-Synchronization - Cache Coherence and memory consistency - Trends in processor design- Need for multi-core processor – difference between multiprocessor and multicore processor- Thread level processing – Simultaneous multi-threading.

Total Hours : 45

REFERENCES :

1 John L. Hennessey and David A. Patterson," Computer Architecture: A Quantitative Approach", Morgan Kaufmann / Elsevier, 6th Edition, 2017.

2 David A. Patterson and John L. Hennessy, Computer Organization and Design – The Hardware / Software Interface, 5th Edition, Morgan Kaufmann, Elsevier, 2014.

3 B.Govindarajalu, “Computer Architecture and Organization”, Tata McGraw Hill Education Pvt. Ltd., 2010.

4 Vincent P. Heuring and Harry F. Jordan, "Computer System Design and Architecture", Addison Wesley, 2nd Edition, 2004.

5 D.Sima, T. Fountain and P. Kacsuk, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

OUTCOMES:

Students to complete this course will be able to

- Suggest the requirements for a new instruction set, to meet the functional requirement and to contribute to performance.

- Analyze changes in performance with various configurations and Memory Hierarchy
- Analyze code for instruction level Parallel Processing and modify the code for out of order execution for better performance
- Modify the code to exploit SIMD architecture and improve the performance of the system.
- Analyze how multi-threading in multiple processors and multi-core processors will share the resources for performance.

CSD6103 COMPUTER NETWORKS AND MANAGEMENT L T P C
3 0 0 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 protocol
- To describe the concept and architecture of network management
- To showcase the different network management protocols like SNMP and ARP, RARP concepts
- To identify various network tools to simulate the working of connection oriented and connectionless networks.

PREREQUISITES: Computer Networks

MODULE I INTRODUCTION TO COMPUTER NETWORKS 9

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 9

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 9

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 9

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 INTERNETWORKING **9**

Network as a Graph, Distance Vector (RIP), Link State (OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems (BGP) - Mobility and Mobile IP

Total Hours: 45

REFERENCES:

1. Simon Parkinson,AndrewCrawton and Richard Hill," Guide to Vulnerability Analsis of Computer Networks and Systems", Springer,2018.
2. 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.
3. Olivier Bonaventure, "Computer Networking: Principles, Protocols and Practice", Creative Commons Attribution, ISBN: 978-1-365-18583-0, 2011.
4. Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI, ISBN-13: 978-0136085300, 2014.
5. **Olivier Bonaventure ,"Computer Networking: Principles, Protocols and Practice", ISBN 1365185834, 9781365185830 ,2016.**

OUTCOMES:

Students to complete this course will be able to

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

ITD6102 SOFTWARE DEVELOPMENT METHODOLOGIES

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To learn various software process model
ii. To understand the requirements analysis concept and techniques
iii. To learn design concept
iv. To be familiar with the DevOps concept
v. To learn how to improve the software development process

MODULE I SOFTWARE PROCESS MODELS **9**

Software Life Span Models – Software Technologies – Software Models – Specialized Process Models – The Unified Process – Agile Development – Software Processes – Team Iterative Processes – Initial Development – Final Stages

MODULE II SOFTWARE REQUIREMENTS ANALYSIS **9**

Unified Modeling Language – Object Oriented Analysis Process: Identifying Classes – Object Analysis: Classification – Identifying Object Relationships, Attributes and Methods

MODULE III Software Design **9**

Designing Classes - Component-Level Design - User Interface Design - Webapp Design - Mobileapp Design

MODULE IV DevOps **9**

Introduction to DevOps - DevOps Framework - DevOps – Continuous Integration and Delivery - DevOps Continuous Deployment

MODULE V SOFTWARE PROCESS IMPROVEMENT **9**

Testing Conventional Applications – Testing Web Applications – Software Process Improvement – Emerging Trends in Software Engineering

Total Hours 45

REFERENCES:

1. Roger S. Pressman, “software engineering” 8th edition, Mc Graw Hill Education, 2015
2. Vaclav Rajlich, “: The Software Engineering Current Practice”, CRC Press, 2012

3. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 1999

OUTCOMES:

On completion of the course, students will be able to

- Choose most appropriate software process model
- Analyze the given requirements and prepare the SRS document
- Develop the complete software design
- Describe the concept of DevOps
- Outline the different methods for software process improvement

ITD6103 SOFTWARE DEVELOPMENT AND TESTING LAB

L	T	P	C
0	0	3	1

OBJECTIVES:

i. To practice software engineering concepts using automated tools.
ii. To practice object-oriented system development methodologies.

List of Sample Exercises

1. Health Insurance Management System
2. Mobile Recharging System
3. Tour Management System
4. Conference Management System
5. E-Banking System

Develop the following for the above applications using Object Oriented System Development Methodologies:

1. Project Planning
2. Software Requirement Specification
3. Software Estimation
4. Object Oriented Software Design
5. Data Modeling & Implementation
6. Test Case Specification
7. Software Testing
8. Software Debugging
9. Software Testing Report

Total Hours : 45

OUTCOMES:

On completion of the course, students will be able to :

- Develop any software in a systematic manner.
- To test software using automated tools.

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SEMESTER – II

ITD6201 CLOUD COMPUTING TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

Enable the students:

- To understand the basic concepts of cloud computing and its enabling technologies
- To be familiar with various cloud infrastructure and management mechanisms
- To have a knowledge in various cloud Architectures
- To learn about various service providers and the different types of cloud services provided.
- To understand the privacy and security issues in cloud environments.

MODULE 1 Cloud Computing Basics 9

Cloud Computing – Basic Concepts and terminology – Goals and benefits – Risks and challenges –Roles and Boundaries – Cloud Characteristics – Cloud Delivery Models – Cloud Deployment Models – Cloud Enabling Technologies

MODULE 2 Cloud Computing Mechanisms 9

Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication – Specialized Cloud mechanisms: Load Balancer, SLA Monitor, Hypervisor, Fail over system – Cloud Management

Mechanisms : Remote Administration, Resource, SLA and Billing Management.

MODULE 3 Cloud Computing Architectures 9

Fundamental Cloud Architectures: Workload distribution, Dynamic Scalability, Elastic Resource capacity, Redundant Storage - Advanced Cloud Architectures: Hypervisor clustering, Non-disruptive service relocation, Dynamic Failure detection and Recovery – Specialized Architectures: Dynamic Data Normalization, Elastic Network capacity, Load balanced Virtual switches.

MODULE 4 Cloud Computing Services 9

Service Providers – Amazon, Google, Microsoft, IBM, Salesforce.com – Cloud Services – collaborating on: Task Management, Event Management, Project Management, Word Processing, Spreadsheets, Presentations, Databases, Storing and Sharing files and other online contents.

MODULE 5 Cloud Security and Privacy 9

Security terms relevant to Cloud computing – Threat Agents – Cloud Security Threats – Cloud Security Mechanisms – Infrastructure Security: Network Level, Host Level, Application Level –Data Security and Storage – Identity and Access Management – Privacy

Total 45 Hours

REFERENCES:

1 Thomas Erl, Zaigham Mahmood, and Ricardo Puttini "Cloud Computing Concepts, Technology & Architecture" Prentice Hall Publication, 2019.

2 Anthony T. Velte, Toby J. Velte and Robert Elsenpeter," Cloud Computing: A Practical Approach", McGraw Hill publication ,2010

3 Michael Miller, "Cloud Computing", Pearson Publication, 2009

4 Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy", Oreilly, 2009.

5 Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms" John Wiley & Sons, Inc Publications, 2011

6 Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing", McGraw-Hill Education Private Ltd.,2013

OUTCOMES:

On completion of the course, the students will be able to

- Demonstrate the fundamentals of cloud computing, its delivery, deployment models and enabling technologies.
- Deal with the various cloud computing mechanisms.
- Explain the various cloud computing Architectures
- Discuss the various cloud providers and the services provided by them.
- Enlighten the challenges behind securing the confidentiality, Integrity and Privacy of the database in cloud.

ECD6201 RESEARCH METHODOLOGY FOR ENGINEERS

L	T	P	C
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 communications of research finding and writing of research reports, papers and ethics in research.

Prerequisites: Basics knowledge of engineering, probability, statistics

Module I Research Problem Formulation 9

Research - objectives - types, Research methods and methodology, 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 - 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 Optimization Techniques 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 9

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 - List of funding agencies - scope for research funding - Patenting, Intellectual Property Rights.

Total Hours 60

Text Book

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, New Age International (P) Ltd, New Delhi, 2003.
6. Kalyanmoy Deb., “Genetic Algorithms for optimization”, KanGAL report, No.2001002.

REFERENCES

1. Holeman, J.P., Experimental methods for Engineers, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2007.
2. Govt. of India, Intellectual Property Laws; Acts, Rules & Regulations, Universal Law Publishing Co. Pvt. Ltd., New Delhi 2010.

OUTCOMES:

At the end of the course, the student should be able to:

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

ITD6202 **MACHINE LEARNING** **L T P C**

3 0 2 4

OBJECTIVES:

i. To understand the principles and application of machine learning.
ii. To learn the theoretical basis for algorithms and techniques.
iii. To understand the various estimation methods.
iv. To learn how to solve end to end machine learning problems.
v. To use kernel trick and solve a non linear problem.

MODULE I INTRODUCTION **8**

Introduction- Machine learning – Examples of machine learning applications- Linear associations – Classification - Regression – Unsupervised learning – Reinforcement learning.

MODULE II BAYESIAN DECISION THEORY **8**

Supervised learning - Learning a class – Learning multiple classes – Regression- Bayesian decision – Classification – Losses and risks - Discriminant functions- Association rules.

MODULE III PARAMETRIC AND NON-PARAMETRIC METHODS **10**

Parametric methods - Maximum likelihood estimation - Evaluating estimator – Bayes estimator- Parametric classification – Non-parametric density estimation - Non parametric classification – Distance based classification – Outlier detection.

MODULE IV DECISION TREE LEARNING **9**

Univariate trees – Classification trees – Regression trees – Pruning – Rule extraction from trees – Learning rules from data – Multivariate trees – Issues in decision tree learning.

MODULE V KERNEL MACHINES **10**

Optimal separating hyperplane - Soft margin hyperplane - v-SVM – Kernal trick - Multiple kernel learning - Multiclass kernel machines – Kernel machines for regression and ranking - Kernel dimensionality reduction.

Total Hours 45

LIST OF EXPERIMENTS

Implementation of the following using Python/ R/ Weka

1. Association Rule
2. Regression Analysis
3. Bayesian decision
4. Univariate trees
5. Multivariate trees
6. v-SVM
7. Kernel dimensionality reduction

Total Lab Hours 30

Total Theory + Lab Hours 75

REFERENCES:

1. Alpaydin Ethem, “Introduction to Machine Learning”, Third edition, PHI Learning Pvt. Ltd, 2015.
2. Tom M. Mitchell, “Machine Learning”, First Edition, McGraw Hill Education, 2017
3. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.
4. Stephen Marsland, “Machine Learning: An Algorithmic Perspective”, first edition, Chapman and Hall/CRC, 2009.

OUTCOMES:

On completion of this course, students will be able to:

- Explain the various machine learning applications.
- Discuss about the supervised learning and Bayesion Decision making processes.
- Identify the parametric and non-parametric methods of classification.
- Discuss the implementations of univariate and multivariate trees.
- Explain the different types of kernel machines and their functions.

VALUE ADDED COURSE	L	T	P	C
	0	0	0	0

OBJECTIVES:

- To expose the latest technology / tools used in the industry and enable the students acquire knowledge and skill set in the same.

GENERAL GUIDELINES:

- Students should undergo any relevant certification course offered by the institution or other institutions / universities / IIT / IISc etc. for a minimum of 40 hours.
- Selection and completion of value added course by the students shall be endorsed by Head of the Department.

OUTCOMES:

- Students should be exposed and gained knowledge in any one latest technology used in the industry

MOOC COURSE	L	T	P	C
	0	0	0	0

OBJECTIVES:

- To learn the basics principles and concepts of the topic in which a project work is undertaken by the student.

GENERAL GUIDELINES:

- Students shall identify a MOOC course related to his/her project topic in consultation with the project supervisor.
- Student shall register for a MOOC course with minimum two credit offered by any recognized organization during the project phase I.
- Selection and completion of MOOC course by the students shall be endorsed by Head of the Department.

OUTCOMES:

Students will be able to

- Familiarize the basic principles and concepts related to the topic of his/her project work.
- Utilize the knowledge gained in the field of study to perform literature review with ease.
- Formulate the experimental / analytical methodology required for the project work

PROFESSIONAL ELECTIVES

I Semester Electives (3 Credit)

ITDY 101 COMPUTER FORENSICS AND INFORMATION SECURITY

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To understand the basics of Information Security
ii. To know the technological aspects of Information Security.
iii. To learn how to critically analyze situations of computer and network usage from a security perspective, identifying the salient issues, viewpoints, and trade-offs.
iv. To know the impact of various cybercrimes and cyber offenses.
v. To have a fundamental understanding of Computer Forensics.
vi. To apply appropriate skills and knowledge in solving computer forensics problems.

MODULE I CRYPTOGRAPHY AND HASH FUNCTION 9

Security problem in computing – Elementary Cryptography – Symmetric Key Encryption -Public Key Encryption –Hash function.

MODULE II PROGRAM SECURITY 9

Security Programs – Non-malicious program Errors – Virus and other Malicious Code – Targeted Malicious Code – Control against program threats.

MODULE III NETWORK SECURITY& WEB SECURITY 9

Threats in Networks– TLS/SSL- Network Intrusion detection and prevention systems- firewalls-– Secure E-Mail- Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

MODULE IV CYBER SECURITY 9

Cyber Crime and security-– Cybercriminals – Classifications of Cybercrimes – Email Spoofing – Spamming – Cyber defamation – Internet Time Theft – Forgery – Web jacking – Hacking – Online Frauds – Software Piracy – Mail Bombs – Password Sniffing – Cyberoffenses – Categories – Planning the attacks – Cyberstalking – Cybercafe and Cybercrimes – Botnets- Security tools-Social Engineering.

MODULE V INTRODUCTION TO COMPUTER FORENSICS 9

History of Forensics – Computer Forensic Flaws and Risks – Rules of Computer Forensics – Legal issues – Digital Forensic Principles – Digital Environments – Digital Forensic Methodologies-Forensic Hardware and Software-Case study.

Total Hours 45

REFERENCES:

1. William Stallings, 'Cryptography and Network Security – Principles and Practices', Sixth Edition, Pearson Education 2013.
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, Fourth Edition, 'Security in Computing', Pearson Education, 2006.
3. Nina Godbole Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley, 2011.
4. Anthony Reyes, Jack Wiles, 'Cybercrime and Digital Forensics', Elsevier publications, 2007.
5. John Sammons, 'The Basics of Digital Forensics', Elesvier 2012.

OUTCOMES: Upon completion of this course, students will be able to:

- Select appropriate techniques to tackle and solve problems in the discipline of information security.
- Perform competitively as a technical support in any organization.
- Discuss various cybercrimes and offences.
- Have a fundamental understanding of Computer Forensics and how resultant evidence can be applied within legal cases.
- Display their competence in the various forensic computing fields.

ITDY 102 MULTIMEDIA TECHNOLOGY AND APPLICATIONS

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To introduce the various multimedia elements along with the theoretical underpinnings and to expose them to integration of these elements.
ii. To give the technological knowledge necessary for creating multimedia content for the web, video, DVD and cellular phones, 2D and 3D graphics, sound and programming.
iii. To provide an insight into digital technologies, media authoring, storage and distribution tools.
iv. To keep up with the current development of contemporary systems of multimedia technology.
v. To gain knowledge in applications of multimedia technology

MODULE I MULTIMEDIA COMPONENTS 9

Introduction to Multimedia: Multimedia Elements - Multimedia System Architecture - Evolving technologies for Multimedia - Defining objects for Multimedia systems - Multimedia Data interface standards - Multimedia Databases.

MODULE II MULTIMEDIA REPRESENTATIONS & COMPRESSION TECHNIQUES 9

Overview of Text and Character representations - Audio: Basic Concepts - Data acquisition and digitization - Audio Formats - Image: Image Representation Formats and compression techniques - Color Schemes - Video: Analogue and Digital Video - Recording Formats and Standards - Transmission of Video Signals - Video Capture - Video compression techniques.

MODULE III DOCUMENT ARCHITECTURE & CONTENT MANAGEMENT 9

Content Management: Content Design and Development - General Design Principles - Hypertext Concepts - Open Document Architecture (ODA) - Multimedia and Hypermedia Coding Expert Group (MHEG) - Standard Generalized Markup Language (SGML) - Document Type Definition (DTD) - Hypertext Markup Language (HTML) in Web Publishing.

MODULE IV MULTIMEDIA NETWORKS 9

Multimedia Networks: Basics of Multimedia Networks - Multimedia Network

Communications and Applications - Quality of Multimedia Data Transmission – Reliable Transport Protocols-RTP, RTCP-Multimedia Over IP - Media-on-Demand (MOD)-Resource Reservation – Protocol: RTSP - Voice & Video Over IP - Multimedia Over ATM Networks-Transport of MPEG4.

MODULE V APPLICATIONS 9

Multimedia in the Real World: Video conferencing - Virtual reality - Interactive video - video on demand - Training and Education -Kiosks – Image Processing – The Multimedia Office -Multimedia in the Home - Case Study: Application for Industrial - Educational and Medical Domains.

Total Hours 45

TEXT BOOKS:

1. Ralf Steinmetz and Klara Nahrstedt, “Multimedia: Computing, Communications and Applications”, Prentice - Hall, India. 2008.

REFERENCES:

1. Tay Vaughan, “Multimedia: Making it work”, Tata McGraw Hill, Eigth Edition, 2011.
2. Ze-Nian Li and Mark S. Drew, “Fundamentals of Multimedia”, Pearson Education, 2008.
3. Andleigh P.K., Thakrar K., Multimedia Systems Design (PHI), 2003.
4. Fred Halsall, “Multimedia Communications: Applications, Networks, protocols and Standards”, Pearson Education, Asia, Second Indian reprint, 2002.

OUTCOMES:

On completion of the course, students will be able to:

- Outline and critically analyze the different elements of multimedia systems.
- Apply and demonstrate the features of text, audio, images, video and active contents of multimedia elements.
- Outline the concepts of document architecture and develop user friendly web pages using HTML and DTD.
- Discuss the multimedia network communications and applications.
- Apply the various multimedia technology to design real world applications.

ITDY 103 HIGH PERFORMANCE NETWORKS L T P C

3 0 0 3

OBJECTIVES:

i. To get an introduction about ATM and Frame relay
ii. To provide an up-to-date survey of developments in High Speed Networks
iii. To enable the students to know techniques involved to support real-time traffic and congestion control.
iv. To provide the different levels of Quality of Service (QoS) to different applications
v. Students will be able to identify the QoS for high speed networks.

MODULE I HIGH SPEED NETWORKS 9

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel - Wireless LAN's: applications, requirements - Architecture of 802.11.

MODULE II CONGESTION AND TRAFFIC MANAGEMENT 9

Queuing Analysis- Queuing Models - Single Server Queues - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

MODULE III TCP AND ATM CONGESTION CONTROL 9

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management -Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

MODULE IV INTEGRATED AND DIFFERENTIATED SERVICES 9

Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services.

MODULE V PROTOCOLS FOR QOS SUPPORT **9**

RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.

Total Hours 45

TEXT BOOKS:

1. William Stallings, 'High Speed Networks And Internet', Pearson Education, Second Edition, 2002.

REFERENCES:

1. IrvanPepelnjk, Jim Guichard and Jeff Apcar, 'MPLS and VPN architecture', Cisco Press, Volume 1 and 2, 2003.
2. Warland&PravinVaraiya, 'High Performance Communication Networks', Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.

OUTCOMES:

Upon completion of this course, students will be able to:

- Define the various high-speed networking technologies and their design issues.
- Manage projects involving any of the high-speed networking technologies.
- Design high speed networks with quality of service (QoS).
- Apply techniques involved to support real-time traffic and congestion control.
- Apply the concept learnt in this course to optimize and troubleshoot high-speed network.

ITDY 104 INTERNETWORKING WITH TCP/IP

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce basics of computer networks, OSI model, layers of TCP/IP, types of addressing and Switching
- To learn about the protocols of network layers and subnetting / supernetting
- To introduce the protocols of transport and application layers
- To learn basics of ns simulator

MODULE I INTRODUCTION **9**

Standards – Internet – History- OSI model – TCP/IP Protocol suite – Addressing – Switching – Connecting devices – IP addressing

MODULE II INTERNET PROTOCOL **9**

Sub netting – Super netting – IP packets – Delivery – Routing – Routing module – Routing table – Datagram – Fragmentation – Checksum – IP Design – ARP – RARP –Internet control message protocol – Multicasting - Internet group management protocol

MODULE III TRANSMISSION CONTROL PROTOCOL **9**

User Datagram protocol – UDP operation – Use – UDP design – TCP services – Flow control – Error control – TCP operation and design – Connection – Congestion control.

MODULE IV APPLICATION LAYER AND CLIENT SERVER MODEL **9**

Concurrency – BOOTP – DHCP – Domain name system – Name space – Distribution – Resolution – Messages – Telnet – Rlogin – Network Virtual Terminal – Character Set – Controlling the server – Remote login.

MODULE V APPLICATION PROTOCOLS **9**

File Transfer Protocol – Connections – Communication – Simple Mail Transfer Protocol – Simple Network Management Protocol – Hyper Text Transfer Protocol – Transaction – Request and Response messages - Introduction to ns simulator

Total Hours : 45

REFERENCES:

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, Tata McGraw Hill fourth Edition 2010.
2. Douglas E. Comer, David L. Stevens, “Internetworking with TCP/IP –Volume I, II and III”, Prentice - Hall of India Pvt. Ltd., 6th Edition 2015.
3. Mahbub Hassan and Raj Jain, “High Performance TCP/IP Networking Concepts, Issues and Solutions”, Prentice - Hall of India Pvt. Ltd, 2015

OUTCOMES:

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

- Describe the history, the need and the purpose of TCP/IP and basics of computer networks and its layers.
- Design networks using subnet and supernet concepts and explain the working of IP, ARP, RARP, ICMP & IGMP protocols and multicasting.
- Discuss about the working of transport layer protocols (TCP and UDP).
- Illustrate working of application layer protocols such as BOOTP,DHCP, DNS, TELNET.
- Illustrate working of application layer protocols such as FTP, SMTP, SNMP, HTTP and create a network topology using ns simulator and monitor the performance of the network.

II Semester Electives (9 Credit)

ITDY 201 MULTICORE ARCHITECTURES L T P C

3 0 0 3

OBJECTIVES:

i. To introduce the recent trends in the field of Computer Architecture and identify performance related parameters.
ii. To appreciate the need for parallel processing.
iii. To study the different types of multicore architectures.
iv. To expose the problems related to multiprocessing.
v. To expose about warehouse-scale and embedded architectures.

MODULE I FUNDAMENTALS OF QUANTITATIVE DESIGN & ANALYSIS AND CLASSES OF PARALLELISM 9

Quantitative Principles of Computer Design -Measuring and Reporting Performance - Classes of Parallelism - ILP, DLP, TLP and RLP – Instruction Level Parallelism (ILP) and its Exploitations- Multithreading – Thread-Level Parallelism (TLP), SMT and CMP Architectures – Limitations of Single Core Processors - The Multicore era – Case studies of Multicore Architectures.

MODULE II DLP IN VECTOR, SIMD AND GPU ARCHITECTURES 9

Vector Architecture – Data Level Parallelism (DLP) - SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units - Detecting and Enhancing Loop Level Parallelism - Case Studies.

MODULE III MULTIPROCESSOR ISSUES 9

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues -performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

MODULE IV RLP AND DLP IN WAREHOUSE-SCALE ARCHITECTURES 9

Introduction to Warehouse-Scale Computers –RLP (Request-Level Parallelism) and DLP in warehouse-scale architectures-Physical Infrastructure and Costs – Cloud Computing – Architectures and Issues-Case Studies.

MODULE V ARCHITECTURES FOR EMBEDDED SYSTEMS 9

Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – The Digital Signal Processor – Embedded Multiprocessors - Case Studies.

Total Hours 45

TEXT BOOK:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.

REFERENCES:

1. Yan Sohilin, “Fundamentals of Parallel Multicore Architecture”, Chapman and Hall/CRC Computational Sciences, Apple Academic Press Inc., ISBN 978148211184, 2015.
2. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
3. Darryl Gove, “Multicore Architecture Programming: For Windows, Linux, and Oracle Solaris”, Pearson, 2011.

OUTCOMES:

On completion of the course, students will be able to:

- Identify the limitations of Instruction-level parallelism and the need for multi-core architectures.
- Analyze the salient features of different multicore architectures and how they exploit Parallelism.
- Critically analyze the problems in shared memory multiprocessors
- Analysis the features of warehouse scale architecture and how they exploit RLP & DLP
- Discuss the architecture of embedded processors.

ITDY 202 SOCIAL NETWORK ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To understand the components of the social network
ii. To model and visualize the social network.
iii. To mine the users in the social network.
iv. To understand the evolution of the social network.
v. To mine the interest of the user.

MODULE I INTRODUCTION 9

Introduction to Web – Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical properties of Social Networks – Network analysis – Development of Social Network Analysis – key concepts and measures in network analysis – Discussion networks – Blogs and online communities – Web – based networks.

MODULE II MODELING AND VISUALIZATION 9

Visualizing Online Social Networks – A Taxonomy of Visualizations – Graph Representation – Centrality Clustering – Node-Edge Diagrams – Visualizing Social Networks with Matrix-Based representations – Node-link Diagrams – Hybrid Representations – Modeling and aggregating social network data – Random walks and their applications – Use of Hadoop and Map Reduce – Ontological representation of social individuals and relationships

MODULE III INVESTIGATION 9

Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web community from a series b Archive – Detecting Communities in Social Networks – Evaluating Communities – Core Methods for Community Dtection & Mining – Applications of Community Mining Algorithms – Node Classification in Social Networks.

MODULE IV SOCIAL NETWORKS 9

Evolution in Social Networks – Framework – Tracing Smoothly Evolving Communities – Models and Algorithms for Social Influence Analysis – Inflence Related Statistics – Social Similarity and Influence – Influence Maximization in Viral Marketing – Algorithms and Systems for Expert Location in Social Networks – Expert Location without Graph Constraints – with Score propagation – Expert

Team Formation – Link Prediction in Social Networks – Feature based Link Prediction – Bayesian Probablistic Models – Probablistic Relational Models.

MODULE V APPLICATIONS 9

Twitter as a Source for Time and Domain Dependent Sentiment Lexicons - The Anatomy of Malicious Pages on Facebook - Diversity and Influence as Key Measures to Assess Candidates for Hiring or Promotion in Academia - Novel Methods of Subscription Type Prediction in Mobile Phone Services - Dynamic Pattern Detection for Big Data Stream Analytics - Combining Feature Extraction and Clustering for Better Face Recognition

Total Hours : 45

REFERENCES:

1. Charu C. Aggarwal, “Social Network Data Analytics”, Springer, 2011.
2. Mehmet Kaya, Jalal Kawash, Suheil Khoury, Min-Yuh Day, Social Network Based Big Data Analysis and Applications, Springer, 2018
3. Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, First Edition, 2010.
4. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, Springer, First Edition, 2011.
5. Giles, Mark Smith, John Yen, “ Advances in Social Network Mining and Analysis”, Springer 2010.
6. Ajith Abraham, Aboul Ella Hassanien, Vaclav Snasel, “Computational Social Network Analysis: Trends, Tools and Research Advances”, Springer, 2009.

OUTCOMES:

Upon completion of the course, the student will be able to

- Work on the internal components of the social network.
- Model and visualize the social network.
- Mine the behavior of the users in the social network.
- Predict the possible next outcome of the social network.
- Mine the social networks.

ITDY 203 DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To understand the importance of communication in distributed environment and the actual implementation of various communication mechanisms.
ii. To study how a distributed operating system works and how it differs from the single processor OS.
iii. To learn how to manage the resources in a distributed environment.
iv. To learn how to make a distributed system fault tolerant.
v. To study how the above-mentioned techniques have been used in actual, real-life distributed systems.

MODULE I COMMUNICATION IN DISTRIBUTED ENVIRONMENT 9

Introduction - Client-Server Paradigm - Threads in distributed Systems - Remote Procedure Call - Remote Object Invocation - Message-Oriented Communication – Stream-Oriented Communication - Multicast Communication.

MODULE II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System – Clock Synchronization - Lamport's Logical clock - Vector Clock - Distributed Mutual Exclusion – Global Positioning of Nodes - Election Algorithms - Distributed Transaction - Distributed Deadlock.

MODULE III CONSISTENCY AND REPLICATION 9

Introduction - Data-Centric Consistency Models - Client-Centric Consistency Models – Replica Management - Distribution Protocols - Consistency Protocols - IVY - Munin - Atomic Transaction.

MODULE IV FAULT TOLERENCE & DISTRIBUTED FILE SYSTEM 9

Introduction to fault Tolerance – Process Resilience - Distributed Commit Protocol – Recovery - Distributed File Systems - Architecture - Issues in Distributed File Systems - Sun NFS.

MODULE V CASE STUDIES 9

Distributed Object-Based System - CORBA - COM - Distributed Coordination-Based System – JINI - Distributed Web-Based System - Google.

Total Hours : 45

REFERENCES:

1. A.S. Tanenbaum, M. Van Steen, “Distributed Systems: Principles and Paradigms”, Pearson Education, 2004.
2. Andrew S. Tanenbaum, “Distributed Operating Systems”, Pearson Education, 2002.
3. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Third Edition, Pearson Education Asia, 2002.
4. Mukesh Singhal, “Advanced Concepts in Operating Systems”, McGraw Hill Series in Computer Science, 1994.
5. M.L. Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.

OUTCOMES:

On completion of the course, students will be able to :

- Identify the communication issues in the distributed systems and how it can be used in remote procedure calls, remote objects and message-oriented communication.
- Analyze the principles of distributed operating systems through various algorithms.
- Select suitable consistency model for distributed shared memory.
- Predict the faults and find the solutions in distributed systems and create the distributed file system architecture for real world needs.
- Compare and demonstrate various case studies in distributed systems.

ITDY 204	APPLIED CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

OBJECTIVES:

i. To understand the classical cryptographic algorithms.
ii. To study the block cipher and advanced encryption standard.
iii. To learn RSA cryptosystem and issues in key distribution.
iv. To analyze the identification and authentication mechanisms.
v. To understand the various secret sharing schemes

MODULE I CLASSICAL CRYPTOGRAPHY **9**

The Shift Cipher, The Substitution Cipher, The Affine Cipher Cryptanalysis-Cryptanalysis of the Affine Cipher, Cryptanalysis of the Substitution Cipher, Cryptanalysis of the Vigenere Cipher, Shannon's Theory.

MODULE II BLOCK CIPHER AND THE ADVANCED ENCRYPTION STANDARD **9**

Substitution - Permutation Networks, Linear Cryptanalysis, Differential Cryptanalysis, The Data Encryption Standard, The Advanced Encryption Standard, Modes of Operation, Cryptography Hash Function - Hash Function and Data Integrity, Security of Hash Function, Iterated Hash Functions, Message Authentication Codes.

MODULE III RSA CRYPTOSYSTEM AND FACTORING INTEGERS **9**

Introduction to Public –key Cryptography, Number theory, The RSA Cryptosystem, Other Attacks on RSA, The ElGamal Cryptosystem, Shanks' Algorithm, Finite Fields, Elliptic Curves over the Reels, Elliptical Curves Modulo a Prime, Signature Scheme –Digital Signature Algorithm.

MODULE IV IDENTIFICATION SCHEME AND ENTITY AUTHENTICATION **9**

Challenge and Response in the Secret-key Setting, Challenge and Response in the Public key Setting, The Schnorr Identification Scheme, Key distribution-Diffie-Hellman Key, Predistribution, Unconditionaly Secure key Predistribution, Key Agreement Scheme Diffie-Hellman Key agreement, Public key infrastructure-PKI, Certificates, Trust Models.

MODULE V SECRET SHARING SCHEMES **9**

The Shamir Threshold Scheme, Access Structure and General Secret key sharing, Information Rate and Construction of Efficient Schemes, Multicast Security and Copyright production - Multicast Security, Broadcast Encryption, Multicast Re-keying, Copyright Protection, Tracing illegally redistribution keys.

Total Hours 45

REFERENCES:

1. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall / CRC, 2006.
2. Menezes A. J, Oorschot P, Vanstone S.A, “Handbook of Applied Cryptography” CRC Press, 1997.
3. William Stallings, “Cryptography and Network Security: Principles and Practices”, Third Edition, Pearson Education, 2006.
4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.
5. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Pearson Education, 2007.

OUTCOMES:

On completion of the course, students will be able to:

- Apply the suitable substitution cipher algorithm for a real world problem.
- Compute the security of data using DES and AES.
- Use the RSA algorithm and factoring integers for secured data transfer.
- Analyze the challenges and responses in secret key distribution.
- Evaluate the secret sharing schemes as per the real world needs**.**

ITDY 205 WIRELESS NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To provide in-depth coverage of advances in wireless networks.
ii. understand the various components of wireless Internet.
iii. To learn the issues of Adhoc wireless network and wireless sensor networks.
iv. To understand the applications of sensor networks.
v. To study an awareness of trends and developments in wireless networks.

MODULE I WIRELESS LANS, PANS AND MANS **9**

Introduction, fundamentals of WLAN -technical issues, network architecture, IEEE 802.11- physical layer, Mac layer mechanism, CSMA/CA, Bluetooth-specification, transport layer, middleware protocol group, Bluetooth profiles, WLL -generic WLL architecture, technologies, broadband wireless access, IEEE 802.16 -differences between IEEE 802.11 and 802.16,physical layer, data link layer.

MODULE II WIRELESS INTERNET **9**

Introduction -wireless internet, address mobility, inefficiency of transport layer and application layer protocol, mobile IP - simultaneous binding, route optimization, mobile IP variations, handoffs, IPv6 advancements, IP for wireless domain, security in mobile IP, TCP in wireless domain - TCP over wireless , TCPs - traditional, snoop, indirect, mobile, transaction- oriented, impact of mobility.

MODULE III AD-HOC WIRELESS NETWORK **12**

Introduction, issues in ad-hoc Wireless Networks, Designing a MAC Protocol for adhoc Wireless Networks, Classification of MAC Protocols, Designing a routing protocol for adhoc Wireless Networks, Classification of routing Protocols- Table – Driven, On-demand and Hybrid routing Protocols, ad-hoc wireless internet.

MODULE IV WIRELESS SENSOR NETWORK **8**

Introduction - applications of sensor network, comparisons with MANET, issues and design challenges, architecture - layered and clustered , data dissemination, data gathering, Mac protocols, location discovery, quality of sensor network - coverage and exposure, zigbee standard.

MODULE V RECENT ADVANCES IN WIRELESS NETWORK 7

UWB radio communication- operation of UWB systems, comparisons with other technologies, major issues, advantages and disadvantages, Wi-Fi systems-service provider models, issues, interoperability of Wi-Fi and WWAN, multimode 802.11 - IEEE 802.11a/b/g - software radio-based multimode system, meghadoot architecture -802.11 phone, fundamentals of UMTS.

Total Hours 45

REFERENCES:

1. C.Siva Ram Murthy and B.S. Manoj, 'Ad-hoc wireless networks-architecture and protocols', Pearson education, 6th printing, 2006.
2. Jochen Schiller, 'Mobile Communication', Pearson education, 2nd edition 2005.
3. WIlliam Stallings, 'Wireless Communication and Networks',Prentice Hall, 2nd edition,2005.

OUTCOMES:

Upon completion of this course, students will be able to:

- Design, deploy and manage wireless local area networks.
- Identify and fix the vulnerabilities in different types of wireless networks as MANETS and WSN.
- A broad knowledge of design considerations used in wide area wireless networks.
- Familiarity with the basic architecture of sensor networks, and how they can be used to assist in network design and implementation.
- updated on latest wireless technologies and trends in the communication field

ITDY 206 VIRTUALIZATION TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To provide knowledge on various types of virtualization techniques.
ii. To understand virtual machine deployment in different operating system platforms.
iii. To know how to apply virtualization for server consolidation.
iv. To impart knowledge on processor, memory, network and storage virtualization.
v. To familiarize themselves with the various devices and virtual machine products.

MODULE I INTRODUCTION & VIRTUAL MACHINES **9**

Understanding Virtualization - Virtualization Software Operation - Virtualization Advantages - Virtual Machine Basics - Creating and Working with Virtual Machines - System Virtual Machines - Hypervisor – Performing P2V Conversions – Building a New Virtual Machine

MODULE II SERVER CONSOLIDATION **10**

Hardware Virtualization - Virtual Hardware Overview - Sever Virtualization - Physical and Logical Partitioning - Types of Server Virtualization - Business cases for Sever Virtualization - Uses of Virtual server Consolidation - Planning for Development - Selecting server Virtualization Platform-Understanding Availability.

MODULE III PROCESSOR & MEMORY VIRTUALIZATION **9**

Managing CPUs for a Virtual Machine-Understanding CPU Virtualization-Configuring VM CPU Options-Tuning Practices for VM CPUs- Managing Memory for a Virtual Machine-Understanding Memory Virtualization-Configuring VM Memory Options-Tuning Practices for VM Memory.

MODULE IV NETWORK & STORAGE VIRTUALIZATION **9**

Networking for a Virtual Machine – SDN Software Stack – Data-Plane Verification – Testing and Debugging - Network Virtualization - Design of Scalable Enterprise Networks - WAN Virtualization – VLANs - Classical Storage Model - SNIA Shared Storage Model - Host based Architecture - Configuring VM Storage Options -Tuning Practices for VM Storage.

MODULE V DEVICES AND APPLICATIONS IN VIRTUAL MACHINES 8

Using Virtual Machine Tools - Understanding Virtual Devices-Configuring a CD/ DVD Drive -Configuring a Sound Card - Configuring USB Devices - Configuring Graphic Displays - Configuring Other Devices - Deploying Applications in a Virtual Environment - Understanding Virtual Appliances and vApps.

Total Hours 45

TEXT BOOKS:

1. Matthew Portnoy, "Virtualization Essentials", John Wiley & Sons, Inc., 2012.
2. William von Hagen, "Professional Xen Virtualization", Wrox Publications, January 2008

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REFERENCES:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. Kumar Reddy, Victor Moreno, "Network virtualization", Cisco Press, July 2006.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.
4. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress 2005.

OUTCOMES:

On completion of the course, students will be able to:

- Analyze types of virtualization techniques and hypervisors.
- Create a virtual machine in Windows and Linux platforms.
- Select server virtualization platforms for business scenarios.
- Discuss processor virtualization and managing memory for a virtual machine.
- Outline storage and network virtualization for virtual networks.
- Discuss on various virtual machines tools and products to deploy applications in virtual environment.

ITDY 207 WEB DESIGN AND MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To familiarize the web page authoring fundamentals.
ii. To explore the web languages using client side script.
iii. To demonstrate and configure web servers and discuss about services.
iv. To design the website with different designing methodology.
v. To publish the website by applying design technologies.

MODULE I WEB PAGE AUTHORING FUNDAMENTALS **9**

Introduction to Web Site Development -Markup Language and Site Development Essentials-XHTML Coding - Elements -Hyperlinks -Tables -Web Forms -Image Techniques -Frames -GUI HTML 5 Editors- Introduction to Networking -TCP/IP Suite and Internet Addressing.

MODULE II WEB LANGUAGES **9**

JavaScript Introduction -Functions, Methods and Events -Program Flow - Object Model - Browser Objects -Language Objects -Interactive Forms - Cookies and JavaScript Security -Client-Side JavaScript Getting Started with Perl- Intro-Arrays - Matching and Substitution -Subroutines –References-Packages –Modules-J query - Bootstrap - Angular Java Script.

MODULE III SERVICES, SERVERS, INTEGRITY **9**

Web servers - IIS & Apache -Windows 2000 DNS Server -Configuring DNS in Windows NT –NetBIOS -Managing WINS -Introduction to FTP -Virtual FTP Servers -FTP Access -Telnet -Xinetd -Web Applications -Perl and E-Commerce Web Servers -Web Servers and Gateways Web Server and Gateway Overview -Streaming Media Servers -Configuring a News Server - Optimizing Servers-Introduction to Security -SSL -Proxy Servers -Introduction to Fault Tolerance -Disaster Assessment and Recovery

MODULE IV DESIGN METHODOLOGY **9**

Overview of Web Design Concepts -Web Project Management Fundamentals -Web Page Layout and Elements -Web Site Usability and Accessibility - Navigation Concepts -Web Graphics -Multimedia and The Web -Ethical and Legal Issues in Web Development -XML and XHTML -Web Page Structure -

Tables and Framesets -Cascading Style Sheets -Site Content and Metadata - JSON.

MODULE V DESIGN TECHNOLOGY 9

Development with Macromedia Dream weaver 10 - Advanced Features -Image Editing with Macromedia Fireworks -Multimedia with Macromedia Flash 11 - Timeline, Layers, Symbols and Buttons - Tweens - Movie Clips - Action script, Masks and Practical Uses -JavaScript and DHTML Fundamentals -Plus-ins and Java Applets -HTTP Servers and Web Applications -Databases -Web Site Publishing and Maintenance.

Total Hours 45

REFERENCES:

1. L. Mohler, Flash 8 Graphics, 'Animation and Interactivity by James', Onword Press, Thomson Learning, 2006.
2. H. M. Deitel**,** P. J. Deitel and T. R. Nieto– How to program', PHI/Pearson Education Asia, November 2011**.**
3. William Stallings, 'Data and Computer Communications', Pearson, 2007.
4. Jason Hunter and William Crawford, 'Java Servlet Programming', O'Reilly Pub1999.
5. Anders Miller, Michael Schwartzbach, 'An Introduction to XML and Web Technologies', Addison Wesley, 2006.

OUTCOMES:

On completion of the course, students will be able to:

- Discuss the web authoring fundamentals.
- Demonstrate web languages and implement client side scripting.
- Configure web servers and evaluate services.
- Design the website by using specific methodologies.
- Publish the website by applying design technologies.

ITDY 208 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To understand the concepts of data warehousing architecture and implementation.
ii. To study the data mining principles and techniques.
iii. To learn to use association rule mining for handling large data sets.
iv. To know the concepts of classification for the retrieval process.
v. To understand the clustering techniques for different methods.
vi. To identify business applications and trends in data mining.

MODULE I DATA WAREHOUSE & BUSINESS ANALYSIS **9**

Data Warehousing - Operational Database Systems vs. Data Warehouses - Data Warehouse Architecture-Components - Multidimensional Data Model - Schemas for Multidimensional Databases - OLAP Operations - Indexing – OLAP Queries & Tools.

MODULE II DATA MINING & DATA PREPROCESSING **9**

Introduction to KDD process - Knowledge Discovery from Databases - Classifications of Data Mining Systems - Need for Data Preprocessing - Data Cleaning - Data Integration and Transformation - Data Reduction - Data Discretization - Data Generalization and Concept Hierarchy Generation.

MODULE III ASSOCIATION RULE MINING **9**

Association Rule Mining - Mining Frequent Item sets with and without Candidate Generation - Mining Various Kinds of Association Rules - Single and Multi-Level Association Rules from Transaction Databases - Correlation Analysis - Constraint Based Association Mining - Advanced Association Rule Techniques

MODULE IV CLASSIFICATION & PREDICITION **9**

Classification vs. Prediction - Data preparation for Classification and Prediction - Classification by Decision Tree Introduction - Bayesian Classification - Rule Based Classification - Classification by Back Propagation - Support Vector Machines - Associative Classification - Lazy Learners - Other Classification Methods - Prediction - Evaluating the Accuracy of a Classifier or Predictor - Ensemble Methods - Model Section.

MODULE V CLUSTERING & TRENDS IN DATA MINING 9

Cluster Analysis - Types of Data in Cluster Analysis - Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods - Density-Based Methods - Grid-Based Methods - Model-Based Clustering Methods - Clustering High-Dimensional Data - Constraint- Based Cluster Analysis - Outlier Analysis – Data Mining Applications.

Total Hours 45

REFERENCES:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”,Pearson Education, 2007.
3. Alex Bezon, Stephen J.Smith, 'Data Warehousing, Data Mining & OLAP', McGraw-Hill Edition, 2001.
4. Paulraj Ponniah, 'Data Warehousing Fundamentals', John Wiley & Sons, New Delhi, 2012.

OUTCOMES:

On completion of the course, students will be able to:

- Analyze the concepts of data warehousing and architecture.
- Discuss data mining principles and techniques and preprocess the data for mining applications.
- Apply association rules for mining the data.
- Outline appropriate classification and prediction methods.
- Discuss clustering methods for high-dimensional data and analyze data mining applications on modern organization.

ITDY 209	SOFT COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

i. To become familiar with AI and neural networks that can learn from available examples and •generalize to form appropriate rules for inferencing systems.

ii. To provide the mathematical background for carrying out the optimization associated with neural network learning.

iii. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience

iv. To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

v. To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing.

PREREQUISITES:

- Artificial Intelligence
- Neural Networks

MODULE I INTRODUCTION TO SOFT COMPUTING 9

Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Definition, Applications. Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm.

MODULE II INTRODUCTION TO NEURAL NETWORK 9

Fundamental Concepts and Models of Artificial Neural Systems: Biological Neurons and Their Artificial Models, Models of Artificial Neural Networks, Neural Processing, Learning and Adaptation, Neural Network Learning Rules and Comparison. Linearly and Non-Linearly Separable Pattern Neural Networks Classification. Perceptron Convergence Theorem. Multi-layer Feed forward Network:

MODULE III FUZZY SET THEORY 9

Brief Review of Conventional Set Theory, Introduction to Fuzzy Sets, Properties of Fuzzy Sets, Operations on Fuzzy Sets, Membership Functions, Fuzzy Extension

Principle, Fuzzy Set Theory Relations, Projection and Cylindrical Extension of Fuzzy Relations, Fuzzy Max-Min and Max-Product Composition. Fuzzy Knowledge Based Systems with Applications, Defuzzification Methods, Fuzzy Composition Rules, Architecture of Mamdani Type Fuzzy Control Systems.

MODULE IV GENETIC ALGORITHM 9

What are Genetic Algorithms? Why Genetic Algorithms? Biological Background: The Cell, Chromosomes, Genetics, Reproduction, Neural Selection, Traditional Optimization and Genetic Algorithms Search Techniques, Genetic Algorithm and Search space: Simple GA, General GA, Operators in GA, Encoding, Selection, Crossover, Mutation, Stopping Condition for GA flow, Constraints in GA, Problem solving using GA, Classification of GA.

MODULE V HYBRID SYSTEMS AND ITS APPLICATIONS 9

ANFIS: Adaptive Neuro-Fuzzy Inference Systems: Introduction, ANFIS Architecture, and Hybrid Learning Algorithm,Applications. AIML with CASE Study

Total Hours : 45

REFERENCES :

1. S.Rajasekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications”, PHI Publication, 2002.
2. S.N. Sivanandam & S.N. Deepa, “Principles of Soft Computing”, Wiley Publications, 2007

OUTCOMES:

Students to complete this course will be able to

- Learn about soft computing techniques and their applications
- Analyze various neural network architectures and able to Understand perceptrons model
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
- Apply genetic algorithms to combinatorial optimization problems.
- Evaluate and compare solutions by various soft computing approaches for a given problem.

ITDY 210 MOBILE COMPUTING TECHNOLOGIES

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To describe the basics of wireless medium access, satellite system and broadcast systems.
ii. To explain the architectures and protocols of various wireless telecommunications systems (GSM, DECT) and compare them.
iii. To classify and discuss the various wireless LAN technologies like ieee 802.11, Bluetooth, etc., and identify the related research issues in wireless LAN.
iv. To illustrate the routing and transport issues in mobile networks and demonstrate the existing solutions
v. To express wireless application layer protocol (WAP)

MODULE I INTRODUCTION **9**

Medium Access Control : Motivation for Specialized MAC- SDMA- FDMA-TDMA-CDMA-Comparison of Access mechanisms – Tele communications : GSM - DECT-– Satellite Systems: Basics- Routing- Localization-Handover- Broadcast Systems: Overview – Cyclic Repetition of Data

MODULE II WIRELESS NETWORKS **9**

Wireless LAN: Infrared Vs Radio Transmission – Infrastructure Networks-Ad hocNetworks- IEEE 802.11 – HIPERLAN – Bluetooth

MODULE III MOBILE NETWORK LAYER **9**

Mobile IP : Goals – Assumptions and Requirement – Entities – IP packet Delivery - Agent Advertisement and Discovery – Registration – Tunneling and Encapsulation – Optimization – Reverse Tunneling – IPv6 – DHCP- Ad hoc Networks

MODULE IV MOBILE TRANSPORT LAYER **9**

Traditional TCP- Indirect TCP- Snooping TCP- Mobile TCP- Fast retransmit/ Fast Recovery- Transmission/ Timeout Freezing – Selective Retransmission-Transaction Oriented TCP

MODULE V WAP **9**

Architecture – Datagram Protocol- Transport Layer Security – Transaction Protocol- Session Protocol- Application Environment-Wireless Telephony Application

Total Hours **45**

REFERENCES:

1. Upena Dalal, Manoj K. Shukla , '**Wireless and Mobile Communication', 2016**
2. J.Schiller, Mobile Communication, Addison Wesley, 2nd edition 2003
3. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley, 1993.
4. William Stallings, Wireless Communication and Networks, Pearson Education, 2005.
5. Singhal, WAP-Wireless Application Protocol, Pearson Education, 2003.

OUTCOMES:

On completion of this course, students will be able to

- express the issues in wireless medium access control and existing solutions and Illustrate the fundamentals of satellite system and broadcast system and also discuss the architectures and working principles of wireless telecommunications systems (GSM, DECT)
- classify and discuss the various wireless LAN technologies like IEEE 802.11, Bluetooth, etc.,
- Identify the issues in mobile routing and explain the existing solutions,
- Identify the issues in transport layer of mobile networks and explain the existing solutions
- Illustrate WAP architecture and protocols

ECDY050 DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

Objectives:

- To describe and explain basic principles of digital image processing
- To discuss about image processing techniques
- To design and implement algorithms for image analysis
- To compare various optimisation techniques for image processing
- To assess the performance of image processing algorithms
- To explain about application of image processing

Prerequisites:

- Basic knowledge on Signals and systems
- Knowledge in Signal Transforms

Module I DIGITAL IMAGE FUNDAMENTALS 9

Review of Digital Image Processing fundamentals- Elements of visual perception, Image sampling & quantisation, Colour image models-Image transforms-DFT, DCT, Haar, Hadamard transform.

Module II IMAGE PROCESSING TECHNIQUES 9

Image Enhancement- Filters &Histogram techniques, Pseudo colour processing, SEM analysis application, Morphological image processing, Image restoration techniques- Remote sensing application, Image Compression-Scalar & Vector Quantisation, Wavelet based compression

Module III IMAGE ANALYSIS 9

Image segmentation-types- Graph theory for segmentation -Object Recognition-Parametric & Non-parametric method-Pattern matching, Neural networks & deep learning, Image fusion-types,3D image visualisation, image analysis for medical images.

Module IV OPTIMISATION TECHNIQUES FOR IMAGE PROCESSING 9

Need for optimisation-Types of optimisation techniques-Swarm intelligence based-Ant Colony Optimization (ACO), Harmony Search Algorithm (HSA) and Artificial Bee Colony (ABC) algorithm and Particle Swarm Optimization (PSO) and Evolution based-Genetic Algorithm(GA).

Module V APPLICATIONS OF IMAGE PROCESSING 9

Finger print classification-face recognition-Iris recognition- Digital watermarking for image-Medical image processing-Industrial machine vision applications-remote sensing application.

Total Hours 45

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”, Fourth Edition, Pearson, 2018.
2. By Joshi, Madhuri A. Digital Image Processing: an Algorithmic Approach, PHI learning private limited,2017
3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
4. Rick S.Blum, Zheng Liu, “Multisensor image fusion and its Applications“, Taylor&Francis, 2006.
5. Vishal Monga, “Handbook of Convex Optimization Methods in Imaging Science”, Springer,2017.
6. Handbook of Image and Video processing – Al Bovik (Alan C Bovik), Academic Press, Second Edition, 2005.

REFERENCE BOOKS:

1. John C. Russ, “The Image Processing Handbook”, Sixth Edition, CRC Press, 2011.
2. Digital Image Procesing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education, 2009.Pvt Ltd, New Delhi.
3. David Salomon: Data Compression- The Complete Reference, Springer Verilog New York Inc., 2nd Edition, 2001

OUTCOMES

At the end of the course, the student should be able to:

- Acquire the knowledge of fundamental concepts of a digital image processing system& image transform
- Describe various techniques for image enhancement, restoration& compression.
- Recognize and apply suitable optimization techniques for image processing applications
- Identify and use appropriate performance metrics for various image processing applications
- Describe about applications of image processing concepts

III Semester Electives (6 Credit)

ITDY 111	DEEP LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

i. To understand about single layer and multi layer neural network.
ii. To learn the various types of neural architecture models.
iii. To know about the architecture of deep feedforward network.
iv. To learn the convolution functions and algorithms.
v. To understand deep recurrent networks and deep learning applications.

MODULE I INTRODUCTION TO NEURAL NETWORKS 8

Introduction – Basic architecture of neural networks – Single computational layer – The perceptron – Multilayer neural network – Training neural networks with back propagation- Practical issues in neural network training.

MODULE II NEURAL ARCHITECTURES 10

Neural architectures for binary classification models - Least squares regression – Logistics regression- Support vector machines - Neural architectures for multiclass models- Multiclass perceptron - Weston Watkins SVM - Non linear activations -Application of simple neural architecture.

MODULE III DEEP FEEDFORWARD NETWORKS 9

Supervised learning algorithm – Unsupervised learning algorithms -Learning XOR – Gradient based learning – Hidden units- Architecture design -Back propagation- other differentiation algorithms.

MODULE IV CONVOLUTION NETWORKS 9

Convolution operation – Motivation - Pooling – Variants of basic convolution function- Structured outputs -Data types – Efficient convolution algorithms – Random / unsupervised features – Convolution networks and deep learning.

MODULE V RECURSIVE NETS 9

Recurrent neural networks (RNN) – Bidirectional RNN – Encoder- Decoder – Deep recurrent networks – Recursive neural networks – Echo state networks - Applications – Large scale deep learning – Computer vision – Natural language processing.

Total Hours 45

TEXT BOOKS:

1. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Springer Publications, 2018
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, The MIT Press, 2016.

REFERENCES:

1. Eugene Charniak, “Introduction to Deep Learning”, The MIT Press, 2019.
2. Itay Lieder, Tom Hope, and Yehezkel S. Resheff, “Learning TensorFlow: A Guide to uilding Deep Learning Systems”, first edition, O'Reilly Media, 2017.

OUTCOMES:

On completion of the course, students will be able to:

- Discuss the different types of neural networks and training process.
- Explain the types of regression techniques and SVM.
- Discuss about the different learning algorithms for feed forward networks.
- Identify the appropriate convolution algorithms for an application.
- Write a case study on real world deep learning application.

ITDY 112 WIRELESS & MOBILE COMMUNICATION L T P C

3 0 0 3

OBJECTIVES:

- To understand the different cellular systems and their advancements from one generation to other.
- To know the different basic propagation mechanisms.
- To have a knowledge about designing a mobile system.
- To recognize various multipath propagation models
- To study the various mobile modulation and demodulation techniques.
- To realize how to alleviate fading effects, and multiple access techniques.

MODULE I INTRODUCTION TO MOBILE COMMUNICATION SYSTEMS 9

Evolution of Mobile Radio Communications – Present Day mobile communication – Fundamental Techniques – Modern Mobile communication systems – 1G, 2G, 3G, Beyond 3G – Wireless Transmission Protocols.

MODULE II MOBILE SYSTEM DESIGN FUNDAMENTALS AND RADIO WAVE PROPAGATION 9

Frequency reuse – Channel assignment strategies – Handoff strategies – Interference and system capacity – Trunking and Grade of service – Improving coverage and capacity in cellular systems – Free Space Propagation Model – The Three Basic Propagation Mechanisms: Reflection, Diffraction and Scattering – Link Budget Design – Outdoor Propagation Models – Indoor Propagation Models.

MODULE III WAVE PROPAGATION AND FADING 9

Multipath Propagation – Multipath and Small Scale Fading – Types of Small Scale Fading – Multipath Channel Parameters – Statistical Models for Multipath Propagation – Simulations of Clarke and Ganes Fading Model.

MODULE IV MOBILE MODULATION TECHNIQUES 9

Amplitude Modulation – Angle Modulation – Digital Modulation – Line coding – Pulse Shaping Techniques – Linear Modulation Techniques – Spread Spectrum Modulation Techniques – Modulation Performance in Fading and Multipath Channels.

MODULE V TECHNIQUES TO ALLEVIATE FADING EFFECTS AND MULTIPLE ACCESS TECHNIQUES **9**

Equalization: – Linear and Non-linear Equalization – Algorithms for Adaptive Equalization Diversity: Polarization Diversity, Frequency Diversity, Time Diversity – Channel Coding: Fundamentals, Block Codes, Convolutional Codes, Coding Gain – Multiple Access Techniques: FDMA, TDMA, SSMA, SDMA.

Total Hours 45

REFERENCES:

1. Theodore S. Rappaport, “Wireless Communications Principles and Practice”,
   Second Edition, Pearson, 2010.
2. Andreas F.Molich, “Wireless Communications”, Second Edition, John Wiley,
   2011.
3. Jorge L.OleneWA, “Guide to Wireless Communications”, Third Edition, Cengage
   Learning, 2014.
4. Cory Beard and William Stallings, “Wireless Communication Networks and Systems”, First Edition, Pearson, 2015.
5. Nishith Tripathi and Jeffrey H. Reed, **“**Cellular Communications: A Comprehensive
   and Practical Guide”, Wiley, 2014.

OUTCOMES:

On completion of the course, students will be able to:

- Explain the fundamentals of cellular radio system design and increase the coverage capacity.
- Discuss various multipath propagation models and different types of fading.
- Demonstrate various mobile transmitter and receiver techniques.
- Apply various techniques to mitigate fading effects.
- Compare and contradict various multiple access techniques.

ITDY 113 BIG DATA COMPUTING L T P C
3 0 0 3

OBJECTIVES:

i. To acquire knowledge of fundamentals of big data and its tools to handle complex and huge amount of data.
ii. To examine the technology for big data using distributed framework like Hadoop.
iii. To discuss the various machine learning techniques available to handle huge amount of data.
iv. To explore the various components of Hadoop distributed framework and its utility.
v. To analyze the various case studies and tools in relation with big data computing.

MODULE I BIG DATA FUNDAMENTALS 9

Introduction to Big Data - Characteristics of Big Data - Challenges and its applications - Big Data Enabling Technologies - Design and Insight of Key Value Store – Apache Cassandra – Data Placement – CAP theorem – Consistency_ Solutions – Hadoop Stack - Design of Zookeeper – Hbase Design – KAFKA.

MODULE II BIG DATA DISTRIBUTED FRAMEWORK & NOSQL 9

Design goals of Distributed File System (HDFS) – Main Configuration of HDFS – Tuning Parameters to control the performance – Concepts of Map Reduce – Internal Working – Implementation Overview – Scheduling and Fault Tolerance – Map Reduce Examples.

MODULE III PARALLEL PROGRAMMING FOR MACHINE LEARNING 9

Introduction to Parallel Programming - Design of SPARK for Parallel Programming – Framework of SPARK – Execution of Functional Programming Scala over SPARK-Examples – Sentimental Analysis using Streaming- SPARK Streaming – Sliding Window Analytics.

MODULE IV BIG DATA – MACHINE LEARNING (ML) 9

Machine Learning Overview – Models of Machine Learning – Classification of Machine Learning- ML Process – Goals & Activities – Generalization and Overfitting – Training - Cross Validation – Examples – Metrics for evaluation of performance of Models – Parallel K-Means using Map Reduce – Big Data Cluster

Analysis – Decision Trees – Random Forest – Gradient Boosted Decision Trees - Predictive Analytics – Regression algorithms – Optimization Theory.

MODULE V BIG DATA & GRAPH ANALYTICS – CASE STUDY 9

Case Study for Sentimental Analysis using streaming with Twitter Data – Case Study with SPARK ML programming – Decision trees and Ensembles – SPARK GraphX – Graph Analytics – Case study – Flight Data Analysis using SPARK GraphX.

Total Hours 45

REFERENCES:

1. Vivek Kale, Big Data Computing: A Guide for Business and Technology Managers, Chapman and Hall/CRC, Published December 1,1st Edition, 2016, ISBN 9781498715331 - CAT# K25337.
2. Jeffrey Dean and Sanjay Ghemawat, “MapReduce: Simplified Data Processing on Large Clusters” Clusters” Clusters” Clusters”, ACM Transactions 2008. http://labs.google.com/papers/mapreduce.html, OSDI'04: Sixth Symposium on Operating System Design and Implementation, San Francisco, CA (2004), pp. 137-150
3. Tom White, Hadoop – The Definitive Guide, 12 Jun 2012, O’Reailly Media Inc, ISBN: 978-1-449-31152-0.
4. Matei Zaharia (Author), Bill Chambers, Spark: The Definitive Guide February 2018, O’Reailly Media Inc ISBN: 9781491912201.

OUTCOMES:

On completion of the course, students will be able to:

- Discuss Big Data Fundamentals, Distributed Framework and NoSQL.
- Outline Distributed Framework and explore .technologies and design.
- Implement parallel programming for machine learning.
- Analyze models and classification with their performance metrics.
- Outline the analytical strategies and case studies.

ITDY 114 ONTOLOGY AND SEMANTIC WEB

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To introduce semantic web and ontology architectures.
ii. To familiarize with the languages for semantic web and ontologies.
iii. To analyze the use of ontology in semantic web.
iv. To demonstrate the use of tools for ontology.
v. To apply the ontology and semantic web in real time applications.

MODULE I INTRODUCTION **8**

Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background -Sample - Knowledge Representation Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation – Layers – Architecture.

MODULE II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES **8**

Web Documents in XML – RDF - Schema – Web Resource Description using RDF- RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics - Traditional Ontology Languages – LOOM- OKBC – OCML – Flogic Ontology Markup Languages – SHOE – OIL - DAML + OIL- OWL.

MODULE III ONTOLOGY LEARNING FOR SEMANTIC WEB **12**

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms - Evaluation.

MODULE IV ONTOLOGY MANAGEMENT AND TOOLS **8**

Overview – need for management – development process – target ontology – ontology mapping – skills management system – ontological class – constraints – issues. Volution – Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.

MODULE V APPLICATIONS **5**

Web Services – Semantic Web Services - Case Study for specific domain – Security issues – current trends.

Total Hours 45

TEXT BOOKS:

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez "Ontological Engineering:with examples from the areas of Knowledge Management, e- Commerce and the Semantic Web" Springer, Revised March 2016.
2. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer (Cooperative Information Systems)", The MIT Press, 2004
3. Alexander Maedche, "Ontology Learning for the Semantic Web", Springer; 1 edition, 2002 John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology –Driven Knowledge Management", John Wiley & Sons Ltd., 2003.
4. John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor) "Semantic WebTechnologies: Trends and Research in Ontology-based Systems"Wiley Publications, Jul 2006.

REFERENCES:

1. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, "Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential",The MIT Press, 2002.
2. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management", Wiley, 2003.
3. Steffen Staab (Editor), Rudi Studer, "Handbook on Ontologies (International Handbooks on Information Systems)", Springer 1st edition, 2004.
4. Dean Allemang (Author), James Hendler (Author) "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL" (Paperback), Morgan Kaufmann, 2008.

OUTCOMES:

On completion of the course, students will be able to:

- Outline the architectures of semantic web and ontology.
- Utilize the languages used for ontology and semantic web.
- Analyze the use of ontology in semantic web.
- Use tools for ontology and semantic web.
- Apply the semantic web and ontology in web services.

ITDY 115 SOFTWARE PROJECT MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

i. To learn the basic concepts of software project management and software estimation methods.
ii. To know the software cost estimation methods.
iii. To learn how to allocate resources for software projects.
iv. To learn how to manage a project
v. To manage peoples

MODULE I PROJECT MANAGEMENT CONCEPT 9

Evolution of Software Economics – Improving Software Economics – Life-Cycle Phases – Manage People – Implement Process – Leverage Tools – Utilize Measurements

MODULE II SOFTWARE ESTIMATION & COSTING 10

Form Vision - Algorithmic Cost Estimation Process, Function Points, SLIM (Software Life cycle Management), COCOMO II (Constructive Cost Model) – Estimating Web Application Development – Organize Resources – Sketch Schedule – Write Plan.

MODULE III RISK MANAGEMENT 7

Risk Definition – Risk Categories – Risk Assessment (Identification / Analysis / Prioritization) – Risk Control (Planning / Resolution / Monitoring) – Failure Mode and Effects Analysis (FMEA)

MODULE IV SOFTWARE PROJECT MANAGEMENT 10

Monitor Project – Engineer a Great Product – Deliver System – Assess Project – Managing Global Software Projects

MODULE V PEOPLE MANAGEMENT 9

PCMM – Team Management – Motivating Software Engineers Working in Virtual Teams Across Glob – Agile Project management

Total Hours: 45

REFERENCES:

1. Günther Ruhe, Claes Wohlin, “Software Project Management in a Changing World, Springer-Verlag, 2014

2. Bob Hughes,Mike Cotterell,Rajib Mall, “Software Project Management “, 5th edition, Tata McGraw-Hill Education Pvt. 2011
3. Roger S. Pressman, “software engineering” 7th edition, Mc Graw Hill Education, 2014
4. Royce, W. “Software Project management: A Unified Framework”, Addison-Wesley, 1998.
5. Joel Henry, “Software Project Management: A Real-World Guide to Success”, Pearson Education, 2004

OUTCOMES:

On completion of the course, students will be able to

i. Explain the software project management concepts
ii. Estimate the cost and prepare project plan document.
iii. Identify and analyze risks.
iv. Express how to manage projects
v. Lead a team and manage the people

ITDY 116 DATA SCIENCE ANALYTICS

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To understand the terminologies and concepts of Data Science
ii. To gather, store and process data for organizations
iii. To learn the processes for extracting and useful patterns from large datasets.
iv. To understand and describe the different stages in a data science project.
v. To learn the data manipulation and data visualization

MODULE I INTRODUCTION TO DATA SCIENCE 8

Introduction- Data Science- Diverse applications of data science – Common data science terminologies – python for data science- Use of Jupyter Notebooks.

MODULE II DATA ANALYTICS LIFECYCLE 10

Data Analytics Lifecycle Overview- Key Roles for a Successful Analytics Project- Discovery- Data Preparation- Model Planning – Model Building – Communicate Results- Operationalize- Case Study: Global Innovation Network and Analysis (GINA).

MODULE III CLUSTERING AND ASSOCIATION 9

Clustering overview- K-means method- Determining number of clusters – Diagnostics – Association rules – apriori algorithm – Candidate rules - Application of association rules- Validation and testing.

MODULE IV REGRESSION AND CLASSIFICATION 9

Linear regression – Use-case - Model description – Logistic regression- use-case - model description –Bayes theorem - Naïve Bayes classifier - Smoothing – Diagnostics of classifier.

MODULE V DATA MANIPULATION AND VISUALIZATION 9

Introduction to NumPy – Data manipulation with Pandas-Data indexing - Selection –Handling missing data - Combining data sets - Visualization - Simple line plots - Scatter plots - Density and contour plots - Histograms.

Total Hours 45

TEXT BOOKS:

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, John Wiley & Sons Inc, 2015.
2. Jake VanderPlas ,"Python Data Science Handbook-Essential Tools for Working with Data", O'Reilly Media, 2016.

REFERENCES:

1. Carl Shan, William Chen, Henry Wang, and Max Song, "The Data Science Handbook: Advice and Insights from 25 Amazing Data Scientists", Data Science Bookshelf, 2015.
2. Viktor Mayer-Schönberger and Kenneth Cukier, "Big Data: A Revolution That Will Transform How We Live, Work, and Think", John Murray Publishers, 2017.

OUTCOMES:

On completion of the course, students will be able to:

- Discuss the different terminologies and various applications of data science.
- Explain the overall life cycle of data analytics process with an example.
- Identify the appropriate data analytical method for data extraction
- Explain the various data science algorithms to build predictive models.
- Use Python for data manipulation and visualization and build data science project.

ITDY 117 GREEN COMPUTING TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

i. To acquire knowledge to adopt green computing practices to minimize energy consumption.
ii. To examine technology for energy management in real-time systems with its green software methodologies.
iii. To discuss the various green enterprise activities, functions and their role with IT.
iv. To discuss the various laws, standards and protocols for regulating green IT.
v. To analyze the various key sustainability and green IT trends with case studies.

MODULE I GREEN IT FUNDAMENTALS, ASSETS & MODELING 9

Green IT Fundamentals: Business, IT, Environment - Green IT Strategies: Drivers, Dimensions, Goals - Green Assets: Buildings, Data Centers, Networks, and Devices - Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture - Green Information Systems: Design and Development Models – Power management in power-aware real time systems – Green Applications.

MODULE II GREEN IT FRAMEWORK & GREEN SOFTWARE 9

Data center virtualization – Implementing Green Data Center – Saving energy –Enabling transparency, Telecommuting, Teleconferencing and Teleporting – Going paperless - Materials recycling – Green Data center – Green Grid framework – Green Software: Energy-saving software techniques, Evaluating and Measuring software impact to platform power.

MODULE III GREEN ENTERPRISES AND ROLE OF IT 9

Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues, Enablers and making the case for IT and Green Enterprise.

MODULE IV REGULATING THE GREEN IT: LAWS, STANDARDS AND PROTOCOLS **9**

Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace.

MODULE V GREEN IT: AN OUTLOOK & CASE STUDY **9**

Greening by IT: A seven-step approach to creating green IT strategy, Research and Development directions, Case Studies: Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

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. Greg Schulz, "The Green and Virtual Data Center", CRC Press, ISBN-13:978-1-4200-8666-9, 2009.
5. 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:

On completion of the course, students will be able to:

- Discuss Green Computing concepts, assets and business process management.
- Outline Green data center framework and Green software methodologies.
- Discuss information systems in Greening enterprises and their roles in IT.
- Analyze the regulatory environment, Green building standards and Green dataCenters.
- Outline the green IT strategies and case studies.

ITDY 118 BLOCKCHAIN ARCHITECTURE AND USE CASES L T P C

3 0 0 3

OBJECTIVES:

Enable the students:

i. To have a fundamental understanding of Blockchain, its historical perspective and its architecture
ii. To understand the design issues and consensus in permission-less and permissioned Blockchain models
iii. To grasp the concepts, benefits and design of blockchain frameworks such as hyperledger fabric and hyperledger composer.
iv. To realize the impact of Blockchain in various areas
v. To comprehend how the business through blockchain is secured

MODULE I INTRODUCTION TO BLOCKCHAIN 9

Blockchain - Blockchain as public ledgers- Evolution of Blockchain – Cryptographically secured Blockchain - Blockchain 2.0 - Smart Contracts – Block in a Blockchain- Distributed Consensus - Cryptocurrency - Digital Signature.

MODULE II PERMISSION-LESS AND PERMISSIONED BLOCKCHAIN MODELS 9

Permission-less model: Bitcoin- Bitcoin Scripts - Transaction in Bitcoin - Consensus in a Bitcoin -Bitcoin Miner –Mining Difficulty - Mining Pool. Permissioned Blckchain: model and use cases - Design issues - Consensus models - Byzantine general problem.

MODULE III BLOCKCHAIN FRAMEWORKS 9

Blockchain for enterprise: Concepts and benefits- The Hyperledger Project - Hyperledger Fabric: Transaction Flow - Fabric Membership and Identity Management - Hyperledger Fabric NetworkSetup, Hyperledger Composer: Application Development - Network Administration.

MODULE IV BLOCKCHAIN SERVICES 9

Blockchain in Financial Service - Blockchain enabled Trade - Supply Chain Financing - Revolutionizing Global Trade - Blockchain in Supply Chain - Blockchain in Healthcare - Blockchain in Energy Markets - Blockchain in Media - Preventing Cyber Crime through blockchain - Blockchain for Defense -

Blockchain for Tax Payments – Blockchain for Managing Land Registry Records.

MODULE V BLOCKCHAIN SECURITY 9

Security considerations for Blockchain - Blockchain Crypto Service Providers - Privacy in a Blockchain System - Smart Contract Confidentiality - PoW vs BFT Consensus - Consensus Finality and Scalability - Fairness and Scalability in Nakamoto Consensus - Authority and Digital Signatures.

Total Hours 45

TEXT BOOKS:

1. Melanie Swan “Blockchain - Blueprint for a New Economy “, 2015, published by O’Reilly Media.

REFERENCES:

1. Andreas M. Antonopoulos “Mastering Bitcoin” 2016, published by O’Reilly Media.
2. Pedro Franco “Understanding Bitcoin - Cryptography, engineering, and economics” 2016, John Wiley and sons Ltd.

OUTCOMES:

On completion of the course, the students will be able to

- Demonstrate the fundamentals of Blockchain, its historical perspective and its architecture
- Deal with the design issues and consensus in permission-less and permissioned Blockchain models
- Explain the concepts, benefits and design of blockchain frameworks such as hyperledger fabric and hyperledger composer and design a model using these.
- Discuss the impact of Blockchain in various areas
- Enlighten how the business through blockchain is secured

ITDY 119 BIG DATA ANALYTICS FOR IoT

L	T	P	C
3	0	0	3

OBJECTIVES:

i. To understand the evolution of big data science and machine intelligence.
ii. To analyze the IoT sensing technologies with IoT framework.
iii. To explore the concepts of machine learning algorithms.
iv. To discuss the big data analytics for cognitive learning with IoT applications.
v. To explore the frameworks of IoT for data science.

MODULE I BIG DATA SCIENCE AND MACHINE INTELLIGENCE 9

Enabling Technologies for Big Data Computing – Interactive SMACT technologies – Mobile Devices – Internet Edge Networks – Cognitive Computing.

MODULE II IOT SENSING, MOBILE AND COGNITIVE SYSTEMS 10

Sensing Technologies for Internet of Things – Introducing RFID sensor technologies – IoT frameworks with interactive environment- Sensing through smart phones – Cognitive Computing Technologies prototype systems – Cognitive Science – Cognitive science – Neuroinformatics- IoT context for cognitive services.

MODULE III SUPERVISED AND UNSUPERVISED MACHINE LEARNING ALGORITHMS 9

Taxonomy of machine Learning algorithms - Supervised Machine learning algorithms- Rule based classification - Nearest neighborhood classifier- Support vector machine- Bayesian classifier – Introduction to association analysis – Clustering methods without labels – Semi-supervised machine learning.

MODULE IV BIG DATA ANALYTICS FOR COGNITIVE LEARNING & IoT 8

IoT based case studies for Healthcare – Machine learning tools – IoT applications – IoT sensing devices - Predictive Analytics – Emotional computing services – Emotional interaction through IoT and Clouds- Performance analysis for decision support systems.

MODULE V ADAPTIVE NEURAL NETWORK STRUCTURE FOR SELF AWARE IOT 9

Introduction to Neural networks, Single Layer Neural networks – Multilayer

Artificial Neural networks – Deep belief Networks – Convolution Neural networks – Pooling in CNN – Self-aware IoT - Neural Network algorithms used in IoT- Case studies.

Total Hours 45

TEXT BOOKS:

1. Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing, Wiley Publications, 2017
2. Bessis, Nik, Dobre, Ciprian, Big Data and Internet of Things: A Roadmap for Smart Environments, Springer Publications, 2014
3. Dey, N., Hassanien, A.E., Bhatt, C., Ashour, A.S., Satapathy, S.C., Internet of Things and Big Data Analytics Toward Next-Generation Intelligence, Springerlink publications, 2018.

OUTCOMES:

On completion of the course, students will be able to:

- Explore fundamentals of IoT in Big data analytics.
- Understand the concepts of Machine learning and Cognitive Science.
- Building frameworks based on IoT environments.
- Explore tools and methods to implement Data Science using machine learning.
- Explore advanced frameworks of Deep learning for data science.

GENERAL ELECTIVES

GEDY 101	PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

The objectives of the course would be to make the students

- Learn to evaluate 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.

GEDY 102 SOCIETY, TECHNOLOGY & SUSTAINABILITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To aware of new technologies through advances in Science and Engineering.
- To make them realize 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, Globalizations and Human Rights – Sustainability and Technology – Population and environment - Technology, Energy and Environment – Organizations 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 globalization.

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.

GEDY 103 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.

GEDY 104 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.

GEDY 105 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 SalenTekinba, 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

GEDY 106 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.

GEDY 107	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

GEDY 108 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

GEDY 109 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.

GEDY 110	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–Breakeven 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

GEDY 111 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. LaureneFausett, “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 course, 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

GEDY 112 JAVA PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

- To study the syntax and necessity of decision making and iterative statements.
- To create a class and invoke the methods with ability handle abnormal conditions.
- To learn to work with various string methods and collection framework.
- To establish a connection to database from java application.
- To understand why Java is useful for the designing web applications.
- To design a graphical user interface (GUI) with Java Swing.

MODULE I INTRODUCTION TO JAVA PROGRAMMING 06

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

MODULE II METHODS AND CLASSES 08

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

MODULE III STRING HANDLING AND COLLECTIONS 07

String Handling - Special String Operations - String Literals- String Conversion - Collections Overview - The Collection Interfaces -The Collection Classes - Accessing a collection Via an Iterator - Working With Maps, Comparators.

MODULE IV DATABASE CONNECTIVITY 08

JDBC - JDBC Driver Types - JDBC Packages - Database Connection - Associating the JDBC/ODBC Bridge with the Database - Statement Objects – Result Set - Transaction Processing – Metadata - Exceptions.

MODULE V SERVER PROGRAMMING 09

The Life Cycle of a Servlet - Using Tomcat for Servlet Development -The Servlet API - Handling HTTP Requests and Responses - Using Cookies - Session Tracking - Java Server Pages (JSP)-Session Objects

MODULE VI SWING PROGRAMMING 07

Concepts of Swing - Java Foundation Class (JFC) - Swing Packages and Classes - Working with Swing - Swing Components

L – 45; TOTAL HOURS-45

REFERENCES :

1. Herbert Schildt, “Java The Complete Reference”, 11th Edition, McGraw Hill, 2018, ISBN: 9781260440249.
2. Joshua Bloch , “Effective Java Paperback”,3rd Edition, Addison Wesley,2017,ISBN: 978-0134685991.
3. E Balagurusamy, “Programming with Java”, 6th Edition, Tata Mcgraw Hill, 2019,ISBN: 978-9353162344.

OUTCOMES:

Students who complete this course will be able to

- Understand the fundamentals java programming language
- Use the Java programming language for various programming technologies.
- Perform various string operations on any given text from user.
- Connect any database with java program and manipulate the contents.
- Write a server side programming which can evaluate the input and respond to user request
- Develop user interface using java swings.

GEDY 113 PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES :

- To study the control statements and string functions of python.
- To practice python data structures - lists, tuples, dictionaries.
- To organize input/output with files in Python.
- To learn the python tools as well as Unicode process.
- To explore advance python including decorators and metaclasses.
- To integrate python with embedded systems.

MODULE I INTRODUCTION TO PYTHON PROGRAMMING 07

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

MODULE II LISTS, TUPLES AND DICTIONARIES 08

Lists - list operations - list slices - list methods - list loop – mutability- aliasing - cloning lists - list parameters - Tuples: tuple assignment- tuple as return value- Dictionaries- operations and methods- advanced list processing - list comprehension- selection sort - insertion sort- merge sort- histogram.

MODULE III FILES, MODULES AND PACKAGES 08

Files and exception - text files - reading and writing files - format operator - command line arguments - errors and exceptions - handling exceptions – modules – packages - word count- copy file.

MODULE IV UNICODE AND BYTE STRINGS 07

String basics - coding basic strings –coding Unicode strings- 3.X bytes objects- 3.X/2.6+ byte array object- text and binary files – Unicode files

MODULE V DECORATORS AND METACLASS 08

Decorator basics- coding function decorators- coding class decorators – managing functions and classes –the metaclass model- declaring metaclasses-coding metaclasses-inheritance and instance-metaclass methods

MODULE VI 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 – 45; Total Hours : 45

REFERENCES :

1. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016, ISBN-13:978-1491939369.
3. Nick Goddard, “Python Programming”, 2nd edition, ISBN: 1533337772, 2016.
4. Mark Lutz, Learning Python: Powerful Object-Oriented Programming, 5th Edition, O'Reilly Media, 2013.
5. Pratik Desai, “Python Programming for Arduino”, 1st edition, Packt publishing, 2015, ISBN: 9781783285938.
6. Richard H. Barnett, Sarah Cox, Larry O'Cull, “Embedded C Programming and the Atmel AVR”, 2nd edition, 2006.
7. Michael Barr, Anthony Massa, “Programming Embedded Systems”, 2nd Edition, O'Reilly Media, 2006.

OUTCOMES :

Students to complete this course will be able to

- Implement date and time function programming using python.
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python Programs.
- Instrument the unicode process using python tools
- Build advance python programs using decorators and metaclass.
- Develop embedded system with python programming.

GEDY 114 INTELLECTUAL PROPERTY RIGHTS

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. AjitParulekar 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

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