

**M.E. / M. TECH (TWO-YEAR FULL TIME & THREE-YEAR PART TIME) DEGREE
PROGRAMME (CBCS)
REGULATIONS -2019**

1. Conditions for Admission

Candidates for admission to the first year of the four-semester M.E / M.Tech Degree programme in Engineering shall be required to have passed B.E / B.Tech degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time. The admission for M.E Part Time programme is restricted to those working or residing within a radius of 90 km from Annamalainagar. The application should be sent through their employers.

2. Branches of Study in M.E / M.Tech

The Branch and Eligibility criteria of programmes are given in Annexure I

3. Courses of study

The courses of study along with the respective syllabi and the scheme of Examinations for each of the M.E / M. Tech programmes offered by the different Departments of study in the Faculty of Engineering and Technology are given separately.

4. Choice Based Credit System (CBCS)

The curriculum includes three components namely Program Core, Program Electives and Open Electives, Mandatory Learning Courses and Audit Courses in addition to Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.

5. Assignment of Credits for Courses

Each course is normally assigned one credit per hour of lecture / tutorial per week and 0.5 credit for one hour of laboratory or project or industrial training or seminar per week. The total credits for the programme will be 68.

6. Duration of the programme

A student of M.E / M.Tech programme is normally expected to complete in four semesters for full-time / six semesters for part-time but in any case not more than four years for full-time / six years for part-time from the date of admission.

7. Registration for courses

A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and Phase-II shall be done at the appropriate semesters.

8. Electives

8.1 Program Electives

The student has to select two electives in first semester, another two electives in the second semester and one more in the third semester from the list of Program Electives.

8.2 Open Electives

The student has to select two electives in third semester from the list of Open Electives offered by the Department and / or other departments in the Faculty of Engineering and Technology.

8.3 MOOC (SWAYAM) Courses

Further, the student can be permitted to earn credits by studying the Massive Open Online Courses offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned. These courses will be considered as equivalent to open elective courses. Thus the credit earned through MOOC courses can be transferred and considered for awarding Degree to the student concerned.

8.4 Value added courses (Inter Faculty Electives)

Of the two open elective courses, a student must study one value added course that is offered by other Faculties in our University either in second or third semester of the M.E programme.

9. Industrial Project

A student may be allowed to take up the one program elective and two open elective courses of third semester (Full Time program) in the first and second semester, to enable him/her to carry out Project Phase-I and Phase-II in an industry during the entire second year of study. The condition is that the student must register those courses in the first semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

10. Assessment

10.1 Theory Courses

The break-up of continuous assessment and examination marks for theory courses is as follows:

First assessment (Mid-Semester Test-I)	:	10 marks
Second assessment (Mid-Semester Test-II):	:	10 marks
Third Assessment	:	5 marks
End Semester Examination	:	75 marks

10.2 Practical Courses

The break-up of continuous assessment and examination marks for Practical courses is as follows:

First assessment (Test-I)	:	15 marks
Second assessment (Test-II)	:	15 marks
Maintenance of record book	:	10 marks
End Semester Examination	:	60 marks

10.3 Thesis work

The thesis Phase I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.

1. Seminar / Industrial Training

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of the seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

2. Student Counselors (Mentors)

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor (mentor) for those students throughout their period of study. Such student counselors shall advise the students in selecting open elective courses from, give preliminary approval for the courses to be taken by the students during each semester, and obtain the final approval of the Head of the Department monitor their progress in SWAYAM courses / open elective courses.

3. Class Committee

For each of the semesters of M.E / M.Tech programmes, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time and first to sixth semesters for Part-time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.
- All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory courses / 40 marks for practical courses, for Industrial Training and for Thesis work (Phase-I and Phase-II) will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

4. Temporary Break Of Study

A student can take a one-time temporary break of study covering the current semester and / or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire programme within the maximum period of four years for Full time / six years for Part time.

5. Substitute Assessments

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end of semester examination may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

6. Attendance Requirements

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.

7. Passing and declaration of Examination Results

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and cumulative grade point average (CGPA) and prepare the mark sheets.

90 to 100 marks	Grade 'S'
80 to 89 marks	Grade 'A'
70 to 79 marks	Grade 'B'
60 to 69 marks	Grade 'C'
55 to 59 marks	Grade 'D'
50 to 54 marks	Grade 'E'
Less than 50 marks	Grade 'RA'
Withdrawn from the Examination	Grade 'W'

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

8. Awarding Degree

After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.

For First Class with Distinction the student must earn a minimum of 68 credits within four semesters for full-time / six semesters for Part time from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn a minimum of 68 credits within two years and six months for full-time / three years and six months for Part time from the time of admission and obtain a CGPA of 6.75 or above.

For Second class, the student must earn a minimum of 68 credits within four years for full-time / six years for Part time from the time of admission.

9. Ranking of Candidates

The candidates who are eligible to get the M.E /M.Tech degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester for M.E / M.Tech full-time / I to VI semester for M.E / M.Tech part-time.

The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester for full-time / I to VI semester for M.E / M.Tech part-time.

10. Transitory Regulations

If a candidate studying under the old regulations M.E. / M.Tech could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old regulations.

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

S.No.	Department		Programme (Full Time & Part time)	Eligible B.E./B.Tech Programme
1	Chemical Engineering	i.	Chemical Engineering	B.E. / B.Tech – Chemical Engg, Petroleum Engg, Petrochemical Technology
		i.	Food Processing Technology	B.E. / B.Tech - Chemical Engg, Food Technology, Biotechnology, Biochemical Engg, Agricultural Engg.
		i.	Industrial Bio Technology	B.E. / B.Tech - Chemical Engg, Food Technology, Biotechnology, Leather Technology
		v.	Industrial Safety Engineering	B.E. / B.Tech – Any Branch of Engineering
2	Civil Engineering	i.	Environmental Engineering	B.E. / B.Tech – Civil Engg, Civil & Structural Engg, Environmental Engg, Mechanical Engg, Industrial Engg, Chemical Engg, BioChemical Engg, Biotechnology, Industrial Biotechnology, Chemical and Environmental Engg.
		i.	Environmental Engineering & Management	

		i.	Water Resources Engineering & Management	B.E. / B.Tech – Civil Engg, Civil & Structural Engg, Environmental Engg, Mechanical Engg, Agricultural and irrigation Engg, Geo informatics, Energy and Environmental Engg.
3	Civil & Structural Engineering	i.	Structural Engineering	B.E. / B.Tech – Civil Engg, Civil & Structural Engg.
		i.	Construction Engg. and Management	
		i.	Geotechnical Engineering	
		v.	Disaster Management & Engg.	
4	Computer Science & Engineering	i.	Computer Science & Engineering	B.E. / B.Tech - Computer Science and Engineering, Information Technology, Electronics and Communication Engg, Software Engineering
5	Electrical Engineering	i.	Embedded Systems	B.E. / B.Tech – Electrical and Electronics Engg, Control and Instrumentation Engg, Information technology, Electronics and communication Engg, Computer Science and Engg
		i.	Smart Energy Systems	B.E. / B.Tech – Electrical and Electronics Engg, Control and Instrumentation Engg, Electronics and communication Engg,
		i.	Power System	
6	Electronics & Communication Engineering	i.	Communication Systems	B.E. / B.Tech -Electronics and Communication Engg, Electronics Engg.
7	Electronics & Instrumentation Engineering	i.	Process Control & Instrumentation	B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electornics Engg, Control and Instrumentation Engg, Instrumentation Engg, , Electronics and Communication Engg,
		i.	Rehabilitative Instrumentation	B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electornics

				Engg, Electronics and Communication Engg, Control and Instrumentation Engg, Instrumentation Engg, Bio Medical Engg, Mechatronics.
		iii	Micro Electronics and MEMS	B.E. / B.Tech – B.E. / B.Tech – Electronics and Instrumentation Engg, Electrical and Electronics Engg, Electronics and communication Engg, Control and Instrumentation Engg, Instrumentation Engg, Bio Medical Engg, Mechatronics, Telecommunication Engg
8	Information Technology	i	Information Technology	B.E. / B.Tech - Computer Science and Engineering, Information Technology, Electronics and Communication Engg, Software Engineering
9	Mechanical Engineering	.	Thermal Power	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Mechanical Engg (Manufacturing).
		.	Energy Engineering & Management	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Mechanical (Manufacturing) Engg, Chemical Engg
10	Manufacturing Engineering	i.	Manufacturing Engineering	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Manufacturing Engg, Production Engg, Marine Materials science Engg, Metallurgy Engg, Mechatronics Engg and Industrial Engg.
		i.	Welding Engineering	
		i.	Nano Materials and Surface Engineering	B.E. / B.Tech – Mechanical Engg, Automobile Engg, Manufacturing Engg, Production Engg, Marine Materials science Engg, Metallurgy Engg, Chemical Engg

**DEPARTMENT OF
INFORMATION TECHNOLOGY**

VISION

To produce globally competent, quality technocrats, to inculcate values of leadership and research qualities and to play a vital role in the socio – economic progress of the nation.

MISSION

- To partner with the University community to understand the information technology needs of faculty, staff and students
- To develop dynamic IT professionals with globally competitive learning experience by providing high class education
- To involve graduates in understanding need based Research activities and disseminate the knowledge to develop entrepreneur skills

PROGRAMME EDUCATIONAL OBJECTIVES

1. Engineers will practice the profession of engineering using a systems perspective and analyze, design, develop, optimize & implement engineering solutions and work productively as engineers, including supportive and leadership roles on multidisciplinary teams.
2. Continue their education in leading graduate programs in engineering & interdisciplinary areas to emerge as researchers, experts, educators & entrepreneurs and recognize the need for, and an ability to engage in continuing professional development and life-long learning.
3. Engineers, guided by the principles of sustainable development and global interconnectedness, will understand how engineering projects affect society and the environment.
4. Promote Design, Research, and implementation of products and services in the field of Engineering through Strong Communication and Entrepreneurial Skills.
5. Re-learn and innovate in ever-changing global economic and technological environments of the 21st century.

M.E. (INFORMATION TECHNOLOGY)

PROGRAMME OUTCOMES (PO)

After the successful completion of the M.E. (Information Technology) degree programme, the students will be able to:

PO1: Apply knowledge of computing, mathematical foundations, algorithmic principles, and engineering theory in the modelling and design of systems to real-world problems (fundamental engineering analysis skills).

PO2 : Apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline.

PO3: Design and conduct experiments, as well as to analyze and interpret data (information retrieval skills). Practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills.

PO4: Analyze a problem, identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution (engineering problem solving skills).

PO5: Understand the appropriate codes of practice and industry standards.

PO6: Identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.

PO7: Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues.

PO8: Communicate effectively, both in writing and orally (speaking / writing skills).

PO9: Understand professional, ethical, legal, security and social issues and responsibilities (professional integrity).

PO10: Formulate and solve moderately complex engineering problems, accounting for hardware/software/human interactions.

Mapping PO with PEO										
PEOs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PEO1	✓	✓	✓		✓		✓	✓	✓	✓
PEO2		✓			✓	✓				✓
PEO3			✓	✓		✓		✓		
PEO4	✓	✓	✓		✓			✓		✓
PEO5	✓		✓	✓		✓	✓		✓	

COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

PROGRAM : M.E

SPECIALIZATION: INFORMATION TECHNOLOGY

SEMESTER I									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
ITITPC11	PC	Program Core-I - Mathematics for Computing	3	-	-	25	75	100	3
ITITPC12	PC	Program Core-II - Advanced Data Structures	3	-	-	25	75	100	3
ITITPE13	PE	Program Elective-I	3	-	-	25	75	100	3
ITITPE14	PE	Program Elective-II	3	-	-	25	75	100	3
ITITMC15	MC	Research Methodology and IPR	2	-	-	25	75	100	2
ITITCP16	CP	Laboratory I - Advanced Data Structures Lab	-	-	3	40	60	100	2
ITITCP17	CP	Laboratory II - Advanced Network Technology Lab	-	-	3	40	60	100	2
ITITAC18	AC	Audit Course-I English for Research Paper Writing	2	-	-	-	-	-	0
			TOTAL			205	495	700	18

SEMESTER II									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
ITITPC21	PC	Program Core-III - Advanced Algorithms	3	-	-	25	75	100	3
ITITPC22	PC	Program Core-IV - Big Data Analytics	3	-	-	25	75	100	3
ITITPE23	PE	Program Elective-III	3	-	-	25	75	100	3
ITITPE24	PE	Program Elective-IV	3	-	-	25	75	100	3
ITITOE25	OE	Open Elective - I	3	-	-	25	75	100	3
ITITCP26	CP	Laboratory III - Big Data and Hadoop	-	-	3	40	60	100	2

		Lab							
ITITTS27	TS	Industrial Training and Seminar/ Mini Project		Tr 2	S 2	40	60	100	2
ITITAC28	AC	Audit Course-II	2	-	-	-	-	-	0
			TOTAL			205	495	700	19

COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

PROGRAM : M.E

SPECIALIZATION: INFORMATION TECHNOLOGY

SEMESTER III									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
ITITPE31	PE	Program Elective-V	3	-	-	25	75	100	3
ITITOE32	OE	Open Elective - II	3	-	-	25	75	100	3
ITITPV33	PV-I	Thesis Phase – I & Viva-voce	-	Pr 16	S 4	40	60	100	10
			TOTAL			90	210	300	16

SEMESTER IV									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
ITITPV41	PV-II	Thesis Phase-II & Viva-voce	-	Pr 24	S 6	40	60	100	15
			TOTAL			40	60	100	15

PC	Program Core	CP	Core Practical	AC	Audit Course
PE	Program Elective	TS	Industrial Training and Seminar	PV	Project work & Viva-voce
OE	Open Elective	MC	Mandatory Learning Course	XX	Branch code
				YY	M.E Specialization Code

LIST OF PROGRAM ELECTIVES

S. No	COURSE CODE	PROGRAM ELECTIVES
1.	ITITPESCN	Advanced Network Technology
2.	ITITPESCN	Integrated Software Engineering Methodology
3.	ITITPESCN	Soft Computing
4.	ITITPESCN	Mobile and Pervasive Computing
5.	ITITPESCN	Optimization Techniques
6.	ITITPESCN	Information Storage and Management
7.	ITITPESCN	Protocols and Architecture for Wireless Sensor Networks
8.	ITITPESCN	Semantic Web
9.	ITITPESCN	Advanced Databases
10.	ITITPESCN	Optical Networks
11.	ITITPESCN	Cluster Computing
12.	ITITPESCN	Cloud computing Technologies
13.	ITITPESCN	Green Computing
14.	ITITPESCN	Quantum Computing
15.	ITITPESCN	Cryptography and Information Security
16.	ITITPESCN	Wireless Communication Techniques
17.	ITITPESCN	Internet of Things
18.	ITITPESCN	Cross – Informatics
19.	ITITPESCN	Text Mining
20.	ITITPESCN	Machine Learning Techniques
21.	ITITPESCN	Software Reliability Engineering
22.	ITITPESCN	3G and 4G Wireless Networks
23.	ITITPESCN	Advanced Image Processing
24.	ITITPESCN	Biometric Security
25.	ITITPESCN	Distributed Systems Security
26.	ITITPESCN	Wireless Security
27.	ITITPESCN	Audio Processing
28.	ITITPESCN	Sensing Techniques and Sensors
29.	ITITPESCN	Advanced Wireless and Mobile Networks
30.	ITITPESCN	Data Warehousing and Mining
31.	ITITPESCN	Advanced Machine Learning
32.	ITITPESCN	Nature Inspired Metaheuristic optimization algorithms
33.	ITITPESCN	Digital Image and Video Processing
34.	ITITPESCN	Ethical Hacking and Network Defense
35.	ITITPESCN	Digital Forensics
36.	ITITPESCN	Computer Vision

LIST OF OPEN ELECTIVES

S.No	COURSE CODE	OPEN ELECTIVES
1.	ITITOESCN	Web Integrated Technologies
2.	ITITOESCN	Decision Management Systems
3.	ITITOESCN	Cyber Forensics
4.	ITITOESCN	Data Science and Analytics
5.	ITITOESCN	Pattern Recognition
6.	ITITOESCN	Human and Computer Interaction
7.	ITITOESCN	Mobile Application Development
8.	ITITOESCN	Information retrieval
9.	ITITOESCN	Middleware for Communications

AUDIT COURSES – I & II

S. No	COURSE CODE	AUDIT COURSES
1.	ITITACSCN	English for Research Paper Writing
2.	ITITACSCN	Disaster Management
3.	ITITACSCN	Sanskrit for Technical Knowledge
4.	ITITACSCN	Value Education
5.	ITITACSCN	Constitution of India
6.	ITITACSCN	Pedagogy Studies
7.	ITITACSCN	Stress Management by Yoga
8.	ITITACSCN	Personality Development through Life Enlightenment Skills

COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

PROGRAM : M.E (PART – TIME) SPECIALIZATION: INFORMATION TECHNOLOGY

SEMESTER I											
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time	
PITITPC11	PC	Program Core-I - Mathematics for Computing	3	-	-	25	75	100	3	ITITPC11	
PITITPC12	PC	Program Core-II - Advanced Data Structures	3	-	-	25	75	100	3	ITITPC12	
PITITMC13	MC	Research Methodology and IPR	2	-	-	25	75	100	2	ITITMC15	

PITITCP14	CP	Laboratory I - Advanced Data Structures Lab	-	-	3	40	60	100	2	ITITCP16
Total						115	285	400	10	

SEMESTER II										
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPC21	PC	Program Core-III - Advanced Algorithms	3	-	-	25	75	100	3	ITITPC21
PITITPC22	PC	Program Core-IV - Big Data Analytics	3	-	-	25	75	100	3	ITITPC22
PITITOE23	OE	Open Elective - I	2	-	-	25	75	100	3	ITITOE25
PITITCP24	CP	Laboratory II - Big Data and Hadoop Lab	-	-	3	40	60	100	2	ITITCP26
Total						115	285	400	11	

COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)
PROGRAM : M.E (PART-TIME) SPECIALIZATION: INFORMATION TECHNOLOGY

SEMESTER III										
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPE31	PE	Program Elective-I	3	-	-	25	75	100	3	ITITPE13
PITITPE32	PE	Program Elective-II	3	-	-	25	75	100	3	ITITPE14

PITITCP33	CP	Laboratory III - Advanced Network Technolgy Lab	-	-	3	40	60	100	2	ITITCP17	
Total								90	210	300	8

SEMESTER IV											
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time	
PITITPE41	PE	Program Elective-III	3	-	-	25	75	100	3	ITITPE23	
PITITPE42	PE	Program Elective-IV	3	-	-	25	75	100	3	ITITPE24	
PITITTS43	TS	Industrial Training and Seminar / Mini Project		Tr	S	40	60	100	2	ITITTS27	
				2	2						
Total								90	210	300	8

SEMESTER V											
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time	
PITITPE51	PE	Program Elective- V	3	-	-	25	75	100	3	ITITPE31	
PITITOE52	OE	Open Elective - II	3	-	-	25	75	100	3	ITITOE32	
PITITPV53	PV-I	Thesis Phase – I & Viva-voce		Pr	S	40	60	100	10	ITITPV33	
				16	4						
Total								90	210	300	16

COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION -2019)

PROGRAM : M.E SPECIALIZATION: INFORMATION TECHNOLOGY

SEMESTER VI										
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPV61	PV-II	Thesis Phase – II & Viva-voce		Pr	S	40	60	100	15	ITITPV41
				24	6					
Total						40	60	100	15	

LIST OF PROGRAM ELECTIVES

S. No	COURSE CODE	PROGRAM ELECTIVES
1.	ITITPESCN	Advanced Network Technology
2.	ITITPESCN	Integrated Software Engineering Methodology
3.	ITITPESCN	Soft Computing
4.	ITITPESCN	Mobile and Pervasive Computing
5.	ITITPESCN	Optimization Techniques
6.	ITITPESCN	Information Storage and Management
7.	ITITPESCN	Protocols and Architecture for Wireless Sensor Networks
8.	ITITPESCN	Semantic Web
9.	ITITPESCN	Advanced Databases
10.	ITITPESCN	Optical Networks
11.	ITITPESCN	Cluster Computing
12.	ITITPESCN	Cloud computing Technologies
13.	ITITPESCN	Green Computing
14.	ITITPESCN	Quantum Computing
15.	ITITPESCN	Cryptography and Information Security
16.	ITITPESCN	Wireless Communication Techniques
17.	ITITPESCN	Internet of Things
18.	ITITPESCN	Cross – Informatics
19.	ITITPESCN	Text Mining
20.	ITITPESCN	Machine Learning Techniques
21.	ITITPESCN	Software Reliability Engineering
22.	ITITPESCN	3G and 4G Wireless Networks
23.	ITITPESCN	Advanced Image Processing
24.	ITITPESCN	Biometric Security
25.	ITITPESCN	Distributed Systems Security
26.	ITITPESCN	Wireless Security
27.	ITITPESCN	Audio Processing

28.	ITITPESCN	Sensing Techniques and Sensors
29.	ITITPESCN	Advanced Wireless and Mobile Networks
30.	ITITPESCN	Data Warehousing and Mining
31.	ITITPESCN	Advanced Machine Learning
32.	ITITPESCN	Nature Inspired Metaheuristic optimization algorithms
33.	ITITPESCN	Digital Image and Video Processing
34.	ITITPESCN	Ethical Hacking and Network Defense
35.	ITITPESCN	Digital Forensics
36.	ITITPESCN	Computer Vision

LIST OF OPEN ELECTIVES

S.No	COURSE CODE	OPEN ELECTIVES
1.	ITITOESCN	Web Integrated Technologies
2.	ITITOESCN	Decision Management Systems
3.	ITITOESCN	Cyber Forensics
4.	ITITOESCN	Data Science and Analytics
5.	ITITOESCN	Pattern Recognition
6.	ITITOESCN	Human and Computer Interaction
7.	ITITOESCN	Mobile Application Development
8.	ITITOESCN	Information retrieval
9.	ITITOESCN	Middleware for Communications

AUDIT COURSES – I & II

S. No	COURSE CODE	AUDIT COURSES
1.	ITITACSCN	English for Research Paper Writing
2.	ITITACSCN	Disaster Management
3.	ITITACSCN	Sanskrit for Technical Knowledge
4.	ITITACSCN	Value Education
5.	ITITACSCN	Constitution of India
6.	ITITACSCN	Pedagogy Studies
7.	ITITACSCN	Stress Management by Yoga
8.	ITITACSCN	Personality Development through Life Enlightenment Skills

ITITPC11	MATHEMATICS FOR COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the mathematical fundamentals for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems and Machine learning.
- To develop many modern techniques in information technology like machine learning, programming language design and concurrency.
- To study various sampling and classification problems.

Probability mass, density and cumulative distribution functions, parametric families of distributions, expected value, variance, conditional expectation, applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov Chains.

Random samples, sampling distributions of estimators, methods of moments and Maximum Likelihood.

Statistical Inference, Introduction to multivariate statistical models: Regression and Classification Problems, Principal Component Analysis, The problem of overfitting model assessment.

Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton Circuits, and Euler Cycles, Permutations and combinations with and without repetition, specialized techniques to solve combinatorial enumeration problems.

Computer Science and Engineering Applications: Data mining, network protocols, analysis of web traffic, computer security, software engineering, computer architecture, operating systems, distributed systems, bioinformatics, machine learning. Recent trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing and computer vision.

REFERENCES:

1. John Vince, “Foundation Mathematics for Computer Science: A Visual Approach”, Springer, 2015.
2. Kishore S. Trivedi, “Probability and Statistics with Reliability, Queuing, and Computer Science Applications”, Wiley, 2001.
3. M. Mitzenmacher and E. Upfal, “Probability and Computing: Randomized Algorithms and Probabilistic Analysis”, Cambridge University Press, 2005.
4. Alan Tucker, “Applied Combinatorics”, Wiley, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. To understand the basic notions of discrete and continuous probability
2. To understand the methods of statistical inference and the role that sampling distributions play in those methods.
3. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓					✓			✓	✓
CO2		✓	✓			✓				
CO3				✓			✓	✓		

ITITPC12	ADVANCED DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The student should be able to choose appropriate data structures, understand the
- ADT/libraries, and use it to design algorithms for a specific problem.
- Students should be able to understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
- Student should be able to come up with analysis of efficiency and proofs of correctness.

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadrees, k-D Trees.

Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

REFERENCES:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. R.F. Gisberg, B.A. Forouzan, "Data Structures", Second Edition, Thomson India, 2005.
4. A.V. Aho, J.E. Hopcroft and J.D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition Reprint, 2003.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the implementation of symbol table using hashing techniques.
2. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. Develop algorithms for text processing applications.
4. Identify suitable data structures and develop algorithms for computational geometry problems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1		✓	✓	✓		✓	✓		✓	✓
CO2	✓	✓	✓	✓					✓	✓
CO3	✓	✓	✓	✓	✓			✓		
CO4	✓	✓	✓	✓	✓					

ITITMC15	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Effective literature studies approaches, analysis Plagiarism, Research ethics

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.

International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.

Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, “Research Methodology: A Step by Step Guide for beginners”, 2nd Edition
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel, “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

ITITCP16	ADVANCED DATA STRUCTURES LAB	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- To acquire the knowledge of using advanced tree structures.
- To learn the usage of heap structures.
- To understand the usage of graph structures and spanning trees.
- To learn the working of various string matching algorithms.

LIST OF EXERCISES

1. Implementation of a Binary Search Tree.
2. Red-Black Tree Implementation.
3. Heap Implementation.
4. Binomial Heaps.
5. Graph Traversals.
6. Spanning Tree Implementation.
7. Shortest Path Algorithms.
8. String Matching Algorithms.
9. Approximation Algorithms.
10. Implementation of Singly Linked List (addition, deletion, insertion in all positions)
11. Implementation of Doubly Linked List (addition, deletion, insertion in all positions)
12. Implementation of Quick sort, Merge sort, Shell sort
13. Implementation of Depth First Search
14. Applications of Linked List, Stack and Queue in real world

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design and implement basic and advanced data structures extensively.
2. Design algorithms using graph structures.
3. Design and develop efficient algorithms with minimum complexity using design techniques.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓					✓	
CO2	✓	✓	✓	✓	✓					✓
CO3	✓	✓	✓	✓				✓	✓	✓

ITITCP17	ADVANCED NETWORK TECHNOLOGY LAB	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- To study various network simulators
- To study about Client / Server communication
- To study about file transfer and multicasting

LIST OF EXERCISES

1. Study of network simulators like NS2, Glomosim, OPNET.
2. Implementation of client-server communication using TCP.
3. Implementation of UDP client server communication using bind, Sendto, Recvfrom system call.
4. Implementation of simple FTP client.
5. Implementation of Domain Name Space.
6. Simulation of BGP/OSPF routing protocol.
7. Simulation of ARP/RARP.
8. Implementation of Peer – to – peer communication using UDP
9. Implementation of Socket program for UDP Echo Client and Echo Server
10. Implementation of file transfer from Client to Server
11. Implementation of Client Server Application for chat
12. Client Server Communication using Object Stream
13. Client Server Communication using Byte Stream
14. Implementation of Online test for a single client
15. Java Multicast Programming

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Implement Client / Server communication.
2. Understand network simulators.
3. Understand multicast programming.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓					✓	
CO2	✓	✓	✓	✓	✓					✓
CO3	✓	✓	✓	✓				✓	✓	✓

ITITPC21	ADVANCED ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Introduce students to the advanced methods of designing and analyzing algorithms.
- The student should be able to choose appropriate algorithms and use it for a specific problem.
- To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
- Students should be able to understand different classes of problems concerning their computation difficulties.
- To introduce the students to recent developments in the area of algorithmic design.

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

One or more of the following topics based on time and interest

Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

REFERENCES:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms"
2. Aho, Hopcroft, Ullman, "The Design and Analysis of Computer Algorithms"
3. Kleinberg and Tardos, "Algorithm Design"

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.
4. Students should have an insight of recent activities in the field of the advanced data structure.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓		✓	✓			✓			✓
CO2	✓	✓	✓	✓		✓				✓
CO3	✓	✓		✓		✓				✓
CO4	✓	✓		✓		✓				

ITITPC22	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn and implement the computational approaches to Modeling, Feature Extraction.
- To grasp the various search algorithms applicable to Big Data.
- To comprehend the necessity and application of Map Reduce.
- To evaluate and infer streaming data.
- To acquire knowledge of how to handle large data sets.

Introduction of Data Science – Basic Data Analytics using R – R Graphical User Interfaces – Data Import and Export – Attribute and Data Types – Descriptive Statistics – Exploratory Data Analysis – Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.

Advanced analytical theory and methods - Overview of Clustering – K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R – Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes’ Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.

Big data from different perspectives - Big data from business Perspective: Introduction of big data-Characteristics of big data-Data in the warehouse and data in Hadoop- Importance of Big data- Big data Use cases: Patterns for Big data deployment. Big data from Technology Perspective: History of Hadoop-Components of Hadoop-Application Development in Hadoop-Getting your data in Hadoop-other Hadoop Component.

Hadoop distributed file system architecture - HDFS Architecture – HDFS Concepts – Blocks – NameNode – Secondary NameNode – DataNode – HDFS Federation – Basic File System Operations – Data Flow – Anatomy of File Read – Anatomy of File Write.

Processing your data with mapreduce - Getting to know MapReduce – MapReduce Execution Pipeline – Runtime Coordination and Task Management – MapReduce Application – Hadoop Word Count Implementation.

REFERENCES:

1. David Dietrich, Barry Heller and Beibei Yang, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley, ISBN 13:9788126556533, 2015.
2. Paul Zikopoulos, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, “Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data”, The McGraw-Hill Companies, ISBN : 978-0-07-179054-3, 2012.
3. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly, ISBN: 9789352130672, 2015.
4. Biris Lublinsky, Kevin T. Smith and Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN 13:9788126551071, 2015.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify the need for big data analytics for a domain.
2. Use Hadoop, Map Reduce Framework.
3. Apply big data analytics for a given problem.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓		✓			✓		✓	✓
CO2	✓	✓	✓	✓	✓	✓			✓	✓
CO3		✓	✓	✓	✓	✓				

ITITCP26	BIG DATA AND HADOOP LAB	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- To understand setting up of Hadoop Cluster.

- To solve problems using Map Reduce Technique.
- To solve Big Data problems.

LIST OF EXERCISES

Cycle I – Data Mining Using Weka

1. Identifying Rules and important Attributes.
2. Executing Classification Algorithms.
3. Deletion of Attribute, Cross Validation and Visualizing.
4. Perform Test Case Scenario.
5. Use Pruning and Reduced Error Pruning.
6. Compare different Classification Algorithms.
7. Clustering Algorithm.
8. Association Rule Mining.

Cycle II – Python Programming

1. Perform Fibonacci Sequence.
2. Calculate Area for Square, Rectangle and Circle.
3. Run a Test of Knowledge.
4. Finding most frequent words in a text read from a file.

Cycle III – Hadoop

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
2. Map Reduce application for word counting on Hadoop cluster.
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using map reduce.
5. Page Rank Computation.
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries.

COURSE OUTCOMES:

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

1. Set up multi-node Hadoop Clusters.
2. Apply Map Reduce algorithms for various algorithms.
3. Design new algorithms that uses Map Reduce to apply on Unstructured and structured data.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓			✓	
CO2	✓	✓	✓	✓	✓				✓	✓

CO3		✓	✓	✓	✓			✓	✓	
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ITITTS27	INDUSTRIAL TRAINING AND SEMINAR / MINI PROJECT	L	TR	S	C
		0	2	2	2

COURSE OBJECTIVES:

- To train the students in the field work related to Information Technology and to have a practical knowledge in carrying out the Information Technology related problems.
- To train and develop skills in solving problems during execution of the problems related to Information Technology.
- To work on a technical topic related to Information Technology and acquire the ability of written and oral presentation.
- To acquire the ability of writing technical papers for Conferences and Journals.

The students will individually undertake a training program in reputed concerns in the field of Information Technology during summer vacation (at the end of second semester for Full Time / Fifth semester for Part – Time) for a minimum stipulated period of four weeks. At the end of training the student has to submit the detailed report on the training undertaken within ten days from the commencement of the third semester for Full Time / Fifth semester for Part – Time. The student will be evaluated by a team of staff members nominated by the Head of the Department through a viva-voce examination.

The students will work for two periods per week guided by student counselor. They will be asked to present a seminar of not less than 15 minutes and not more than 30 minutes on any technical topic of student’s choice related to Information Technology and to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation, the report and also on the interaction shown during the seminar.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Apply prior acquired knowledge in problem solving and to demonstrate the use, interpretation and application of an appropriate international Information Technology standard in a specific situation.
2. Analyze a given Information Technology problem and to identify and implement appropriate problem-solving methodology to propose a meaningful solution.
3. Present the solution acquired in the form of written and oral presentation.
4. Face the audience and to interact with them confidently.

5. Acquire the ability to work in the actual environment and to use the technical resources.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓			✓		✓	✓
CO2		✓			✓			✓	✓	✓
CO3	✓	✓	✓		✓		✓		✓	
CO4	✓	✓	✓	✓	✓	✓			✓	
CO5		✓	✓	✓	✓		✓	✓	✓	

ITITPV33	THESIS PHASE – I & VIVA - VOCE	L	PR	S	C
		0	16	4	10

COURSE OBJECTIVES:

- To train the students in the current thrust area in Information Technology and to have practical knowledge in handling the technical scenario.
- To develop skills on the research topic and to implement the appropriate methods to handle the issue.

The students will individually undertake a research problem in the field of Information Technology in the third semester for Full-Time / Fifth semester for Part-Time. The student will be guided by a staff member. The progress of the research will be evaluated every month by a team of staff members. The student has to submit the detailed report on the research problem at the end of Third semester for Full-Time / Fifth semester for Part-Time. The student will be evaluated by a team of examiners nominated by the Head of the Department through a viva-voce examination.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Conduct independent empirical research to evaluate and present their results responsibly and critically.
2. Present the conclusions with understandability using appropriate tables and graphs in the form of report.
3. Maintain the ethical standards of scientific research and to follow the basic principles in an academic community that requires constant learning and knowledge updation.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10

CO1	✓		✓	✓		✓		✓		✓
CO2		✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓		✓		✓		✓	✓

ITITPV41	THESIS PHASE – II & VIVA - VOCE	L	PR	S	C
		0	24	6	15

COURSE OBJECTIVES:

- To train the students in the current thrust area in Information Technology and to have practical knowledge in handling the technical scenario.
- To develop skills on the research topic and to implement the appropriate methods to handle the issue.

The students will continue the research problem undertaken during third semester for Full-Time / Fifth semester for Part-Time in the field of Information Technology. The student will be guided by a staff member. The progress of the research will be evaluated every month by a team of staff members. The student has to submit the detailed report on the research problem at the end of Fourth semester for Full-Time / Sixth semester for Part-Time. The student will be evaluated by a team of examiners nominated by the Head of the Department through a viva-voce examination.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Conduct independent empirical research to evaluate and present their results responsibly and critically.
2. Present the conclusions with understandability using appropriate tables and graphs in the form of report.
3. Maintain the ethical standards of scientific research and to follow the basic principles in an academic community that requires constant learning and knowledge updation.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓		✓	✓		✓		✓		✓
CO2		✓		✓		✓	✓		✓	✓
CO3	✓	✓	✓		✓		✓		✓	✓

PROGRAM ELECTIVES

ITITPESCN	ADVANCED NETWORK TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an introduction to the principles and practices of Network Engineering.

- To understand the architecture of the network devices.
- To explore the emerging technologies in network engineering.

Communication Networks – Network Elements – Switched Networks and Shared Media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching – Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration.

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping Policies for BE and GS models – Traffic Shaping Algorithms – End to End Solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in Inelastic Traffic.

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behavior – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP.

Network Devices – Switch – Router – Hardware Components- Software – Configuration – Routing Concepts- Static Routing – Dynamics Routing–Switching and Routing Devices – Router Structure – Configuring EGP – RIP – OSPF – IS-IS – Hub – Bridges – Routers – Link Virtualization – Multicast Architecture.

History – Data Plane Support for SDN – Software Routers – Programmable Hardware –Control Plane Support for SDN – Modern SDN Stack – Programming Languages – Applications – Data Centre Networking –Software Defined Radio – Campus Networks.

REFERENCES:

1. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education/PHI, 2009.
2. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fifth Edition, Morgan Kaufman Publishers, 2012.
3. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
4. James Macfarlane ,” Network Routing Basics: Understanding IP Routing in Cisco Systems”, Wiley Edition I, 2006.
5. William Stallings, High Speed Networks: Performance and Quality of Service, Pearson Education, 2008.
6. Mani Subramaniam, Network Management: Principles and Practices, Pearson Education, 2010.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Gain an understanding of the principles of network engineering.
2. Knowledge of advanced network engineering concepts and techniques.
3. Explore the emerging technologies in network engineering.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1		✓	✓	✓		✓	✓		✓	✓
CO2	✓	✓	✓	✓					✓	✓
CO3	✓	✓	✓	✓	✓			✓		

ITITPESCN	INTEGRATED SOFTWARE ENGINEERING METHODOLOGY				L	T	P	C
					3	0	0	3

COURSE OBJECTIVES:

- To provide information about wider engineering issues that form the background to developing complex, evolving (software-intensive) systems.
- To plan a software engineering process to account for quality issues and non – functional requirements.
- To employ a selection of concepts and techniques to complete a small-scale analysis and design in mini projects.
- To impart knowledge to translate requirement specifications into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- To provide basic knowledge about software project management.

Introduction – S/W Engineering Paradigm — Life Cycle Models –Introduction to System Concepts - Managing Complex Software — Properties – Object Oriented Systems Development – Object Basics – Systems Development Life Cycle Rumbaugh Methodology - Booch Methodology - Jacobson Methodology – Unified Process.

Systems Engineering - Analysis Concepts - Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary. Unified Approach – Unified Modeling Language – Static behavior diagrams – Dynamic Behavior diagrams – Object Constraint Language.

Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Requirements to Design – Design Axioms – Logical Architecture - Designing Objects with Responsibilities – Object Design – Designing for Visibility. Patterns – Analysis and Design patterns – GoF Patterns - Mapping designs to code –Test Driven development and refactoring – UML Tools and UML as blueprint.

Taxonomy of Software Testing – Types of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based on Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques.

Measures and Measurements – ZIPF’s Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools.

REFERENCES:

1. Ian Sommerville, “Software engineering”, Ninth Edition, Pearson Education Asia, 2010.
2. Roger S. Pressman, “Software Engineering – A practitioner’s Approach”, Seventh Edition, Tata McGraw-Hill International Edition, 2009.
3. Ivar Jacobson, “Object Oriented Software Engineering”, Pearson Education, 1992.
4. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Third Edition, Narosa publications, 2011.
5. Craig Larman. “Applying UML and Patterns – An introduction to Object-Oriented Analysis and Design and Iterative Development”, 3rd edition, Pearson Education, 2005.
6. Fowler, Martin, “UML Distilled”, 3rd Edition, Pearson Education, 2004.
7. Michael Blaha and James Rumbaugh, “Object-oriented modeling and design with UML”, Prentice-Hall of India, 2005.
8. Grady Booch, “Object Oriented Analysis and Design”, 2nd edition, Pearson Education, 2000.
9. Ali Bahrami, “Object Oriented Systems Development”, Tata McGrawHill, 1999.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Learn UML models and tools.
2. Apply design patterns on various applications.
3. Understand the concepts and techniques to complete a small-scale analysis and design in mini projects.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓		✓	✓				✓
CO2		✓	✓	✓	✓			✓	✓	
CO3	✓	✓	✓			✓			✓	✓

ITITPESCN	SOFT COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
- To implement soft computing based solutions for real-world problems.
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
- To provide student an hand-on experience on MATLAB to implement various strategies.

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS:
Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm.

Implementation of recently proposed soft computing techniques.

REFERENCES:

1. Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice Hall of India, 2003.
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic:Theory and Applications”, Prentice Hall, 1995.
3. MATLAB Toolkit Manual

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓		✓	✓				✓
CO2		✓	✓	✓	✓			✓	✓	
CO3	✓	✓	✓			✓			✓	✓
CO4	✓	✓	✓			✓				

ITITPESCN	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Mobile Computing and Personal Computing.
- To learn the role of cellular networks in Mobile and Pervasive Computing.
- To expose to the concept of sensor and mesh networks.
- To expose to the context aware and wearable computing.
- To learn to develop applications in mobile and pervasive computing environment.

Introduction – Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices.

3G AND 4G Cellular Networks – Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP.

Sensor And Mesh Networks – Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks.

Context Aware Computing & Wearable Computing – Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware Health BAN- Medical and Technological Requirements- Wearable Sensors-Intra-BAN communications.

Application Development – Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone.

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing: Technology, Applications and Service Creation”, 2nd ed, Tata McGraw Hill, 2010.

2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
3. Pei Zheng and Lionel M Li, "Smart Phone & Next Generation Mobile Computing", Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein, "Fundamentals of Mobile and Pervasive Computing", TMH, 2005.
5. Jochen Burthardt et al, "Pervasive Computing: Technology and Architecture of Mobile Internet Applications", Pearson Education, 2003.
6. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufmann Publishers, 2004.
7. Uwe Hansmaan et al, "Principles of Mobile Computing", Springer, 2003.
8. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
9. Mohammad s. Obaidat et al, "Pervasive Computing and Networking", John Wiley & Sons, 2011.
10. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, 2009.
11. Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III Loren Schwiebert "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill, 2005.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design a basic architecture for a pervasive computing environment.
2. Design and allocate the resources on the 3G-4G wireless networks.
3. Analyze the role of sensors in Wireless networks.
4. Work out the routing in mesh network.
5. Deploy the location and context information for application development.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1		✓	✓	✓	✓	✓	✓			
CO2		✓	✓	✓	✓	✓				✓
CO3	✓			✓						
CO4	✓	✓	✓	✓	✓	✓				
CO5	✓	✓	✓		✓	✓	✓			✓

ITITPESCN	OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide insight to the mathematical formulation of real world problems.
- To optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems.
- To introduce recent trends and applications in optimization.

Engineering application of Optimization, Formulation of design problems as mathematical programming problems.

General Structure of Optimization Algorithms, Constraints, The Feasible Region.

Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.

Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.

Real life Problems and their mathematical formulation as standard programming problems.

Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.

REFERENCES:

1. Laurence A. Wolsey, "Integer programming", Wiley, 1998.
2. Andreas Antoniou, "Practical Optimization Algorithms and Engineering Applications".
3. Edwin K., P. Chong & Stanislaw h. Zak, "An Introduction to Optimization".
4. Dimitris Bertsimas; Robert Weismantel, "Optimization over integers, Dynamic Ideas", 2005, ISBN 978-0-9759146-2-5.
5. John K. Karlof, "Integer programming: theory and practice", CRC Press, 2006.
6. H. Paul Williams, "Logic and Integer Programming", Springer, 2009.
7. Michael Jünger, Thomas M. Liebling, Denis Naddef, George Nemhauser, William R. Pulleyblank, Gerhard Reinelt, Giovanni Rinaldi, Laurence A. Wolsey, "50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art", Springer, 2009.
8. Der-San Chen, Robert G. Batson, Yu Dang, "Applied Integer Programming: Modeling and Solution", John Wiley and Sons, 2010.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Formulate optimization problems.
2. Understand and apply the concept of optimality criteria for various types of optimization problems.
3. Solve various constrained and unconstrained problems in Single variable as well as multivariable.
4. Apply the methods of optimization in real life situation.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓		✓				✓
CO2		✓	✓	✓						
CO3	✓						✓			✓
CO4		✓	✓	✓	✓		✓			

ITITPESCN	INFORMATION STORAGE AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To identify the components of managing the data center and understand logical and Physical components of a storage infrastructure.
- To evaluate storage architectures including storage subsystems SAN, NAS, IPSAN, CAS.
- To understand the business continuity, backup and recovery methods.

Introduction to Information Storage Management - Data Center Environment- Database Management System (DBMS) - Host - Connectivity –Storage-Disk Drive Components- Intelligent Storage System -Components of an Intelligent Storage System- Storage Provisioning- Types of Intelligent Storage Systems.

Fibre Channel: Overview - SAN and Its Evolution -Components of FC SAN -FC Connectivity-FC Architecture- IPSAN-FCOE-FCIP-Network-Attached Storage-General-Purpose Servers versus NAS Devices - Benefits of NAS- File Systems and Network File Sharing-Components of NAS - NAS I/O Operation -NAS Implementations -NAS File-Sharing Protocols-Object-Based Storage Devices Content - Addressed Storage -CAS Use Cases.

Business Continuity -Information Availability -BC Terminology-BC Planning Life Cycle - Failure Analysis -Business Impact Analysis-Backup and Archive - Backup Purpose Backup Considerations -Backup Granularity - Recovery Considerations -Backup Methods -Backup Architecture - Backup and Restore Operations.

Cloud Enabling Technologies -Characteristics of Cloud Computing -Benefits of Cloud Computing -Cloud Service Models-Cloud Deployment models - Cloud Computing Infrastructure-Cloud Challenges.

Information Security Framework -Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure - Storage Infrastructure Management Activities -Storage Infrastructure Management Challenges.

REFERENCES:

1. EMC Corporation, "Information Storage and Management", Wiley India, Edition, 2011.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, Edition, 2001.
4. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2002.

COURSE OUTCOMES:

Upon completion of this course the students may be able to

1. Provide a variety of solutions for storing, managing, accessing, protecting, securing, sharing and optimizing information.
2. Evaluate storage architectures, including storage subsystems SAN, NAS, IPSAN, CAS.
3. Understand the business continuity, backup and recovery methods.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓					✓	✓
CO2	✓	✓	✓	✓	✓	✓				
CO3	✓	✓						✓	✓	✓

ITITPESCN	PROTOCOLS AND ARCHITECTURE FOR WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the issues in the design of ad hoc and wireless sensor networks.
- To understand the working of protocols in different layers of ad hoc and sensor networks.
- To expose the students to different aspects in ad hoc and sensor networks.
- To understand various standards and applications in ad hoc and sensor networks.

Introduction and Overview of Wireless Sensor Networks, Background of Sensor Network Technology, Application of Sensor Networks, Challenges for Wireless Sensor Networks, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

Architectures, Single-node Architecture, Hardware Components & Design Constraints, Operating Systems and Execution Environments, Introduction to TinyOS and nesC, Network Architecture, Sensor Network Scenarios, Optimization

Goals and Figures of Merit, Design Principles for WSNs, Service Interfaces of WSNs, Gateway Concepts.

Deployment and Configuration, Localization and Positioning, Coverage and Connectivity, Single-hop and Multi-hop Localization, Self-Configuring Localization Systems, Sensor Management Network Protocols: Issues in Designing MAC Protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC Protocol, IEEE 802.15.4 Standard and Zig Bee, Dissemination Protocol for Large Sensor Network.

Routing Protocols and Data Manipulation, Issues in Designing Routing Protocols, Classification of Routing Protocols, Energy-Efficient Routing, Unicast, Broadcast and Multicast, Geographic Routing. Data Centric and Content based Routing, Storage and Retrieval in Network, Compression Technologies for WSN, Data Aggregation Technique.

Sensor Network Platforms and Tools, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level Software Platforms, Node-level Simulators, State-centric Programming.

REFERENCES:

1. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.
3. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, “Wireless Sensor Network”, Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
5. N. P. Mahalik, “Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications” Springer – Verlag Berlin Heidelberg, 2007.
6. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

COURSE OUTCOMES:

Upon completion of this course students should be able to

1. Identify different issues in wireless ad hoc and sensor networks.
2. Analyze the protocols developed for ad hoc and sensor networks.
3. Identify and discuss the standards and applications of ad hoc and sensor networks.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓						✓
CO2	✓	✓	✓		✓	✓				
CO3		✓						✓		✓

ITITPESCN	SEMANTIC WEB	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the importance of semantic web.
- To understand various semantic knowledge representation strategies.
- To learn the concepts of ontology.
- To learn the ontology related tools.

The Future of the Internet: Introduction - The Syntactic Web – The Semantic Web - How the Semantic Web Will Work. Ontology in Computer Science - Defining the Term Ontology - Differences among Taxonomies – The sauri – and Ontologies, Classifying Ontologies - Web Ontologies, Web Ontology Description Languages - Ontology - Categories - and Intelligence.

Knowledge Representation in Description Logic – Introduction - An Informal Example - The Family of Attributive Languages - Inference Problems. RDF and RDF Schema – Introduction - XML Essentials – RDF – RDF Schema - A Summary of the RDF/RDF Schema Vocabulary. OWL – Introduction - Requirements for Web Ontology Description Languages – Header Information – Versioning – and Annotation Properties – Properties – Classes – Individuals – Data types - A Summary of the OWL Vocabulary.

Rule Languages – Introduction - Usage Scenarios for Rule Languages – Datalog – RuleML – SWRL - TRIPLE. Semantic Web Services – Introduction - Web Service Essentials – OWL - S Service Ontology - An OWL - S Example.

Methods for Ontology Development – Introduction - Uschold and King Ontology Development Method - Toronto Virtual Enterprise Method – Methontology - KACTUS Project Ontology Development Method – Lexicon – Based Ontology Development Method - Simplified Methods Ontology Sources – Introduction – Metadata – Upper Ontologies Other Ontologic of Interest – Ontology Libraries.

Semantic Web Software Tools – Introduction - Metadata and Ontology Editors – Reasoners - Other tools. Software Agents – Introduction - Agent Forms - Agent Architecture - Agents in the Semantic web Context. Semantic Desktop – Introduction - Semantic Desktop Metadata - Semantic Desktop Ontologies - Semantic Desktop Architecture - Semantic Desktop Related Applications. Ontology Application in Art – Introduction – Ontologies for the Description of Works of Art - Metadata Schemas for The Description of Works of Art - Semantic Annotation of Art Images.

REFERENCES:

1. Karin K. Breitman, Marco Antonio Casanova and Walter Truszkowski, “Semantic Web Concepts: Technologies and Applications”, Springer Science & Business Media, 2007.
2. Heiner Stuckenschmidt, Frank van Harmelen,” Information Sharing on the Semanting Web”, Springer Science & Business Media, 2005.
3. Grigoris Antoniou, Frank Van, “Semantic Web Primer”, MIT press, 2004.

4. Rudi Studer, Stephan Grimm, Andrees Abeker, "Semantic Web Services: Concepts, Technologies and Applications", Springer, 2007.
5. John Davis, Dieter Fensal, Frank Van Harmelen, J. Wiley, "Towards the Semantic Web: Ontology Driven Knowledge Management", John Wiley & Sons, 2003.

COURSE OUTCOMES:

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

1. Compare conventional web with semantic web.
2. Analyze and design semantic knowledge representation modes.
3. Construct ontology using different tools.
4. Use semantic web services with web applications.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓			✓	
CO2		✓	✓	✓	✓					
CO3	✓	✓		✓	✓			✓	✓	✓
CO4		✓	✓	✓	✓					

ITITPESCN	ADVANCED DATABASES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of advanced data models.

Database System Architectures: Centralized and Client-Server Architectures – Server System

Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies.

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and

Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications Design –Principles for Active Rules- Temporal Databases: Overview of Temporal Databases-TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Implementation of Rules and Recursion- Recursive Queries in SQL - Spatial Databases - Spatial Data Types- Spatial Relationships- Spatial Data Structures – Spatial Access Methods- Spatial DB Implementation.

Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models –Concurrency Control – Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data- Storage-Analysis.

REFERENCES:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2008.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Fourth Edition, Pearson Education, 2008.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
4. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, “Advanced Database Systems”, Morgan Kaufmann publishers, 2006.
6. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.
7. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Develop in-depth understanding of relational databases and skills to optimize database performance in practice.
2. Understand and critique on each type of databases.
3. Design faster algorithms in solving practical database problems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓			✓	✓		✓	✓
CO2	✓	✓	✓	✓					✓	
CO3	✓	✓	✓	✓	✓	✓				✓

ITITPESCN	OPTICAL NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable the student to understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods in vogue.
- To expose the student to the advances in packet switching in the optical domain, the associated challenges and the possible solution approaches.
- To introduce to high capacity networks.

Introduction – Light wave generation systems, system components, optical fibers, SI, GI, fibers, modes, Dispersion in fibers, limitations due to dispersion, Fiber loss, nonlinear effects. Dispersion shifted and Dispersion flattened fibers. Optical transmitters, receivers and amplifiers. First- and second-generation optical networks, Components: couplers, isolators, circulators, multiplexers, filters, switches, and wavelength converters.

Optical Network Architectures – Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks- Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture. Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures, Ring architectures, Network Management.

Broadcast And Select Networks – Topologies, Single-hop, Multihop, and Shufflenet multihop networks, Media-Access control protocols, Test beds. WAVELENGTH-ROUTING NETWORKS: The Optical layer, Node Designs, Optical layer cost tradeoff, Routing and Wavelength Assignment, Virtual Topology design, Wavelength Routing Test beds, Architectural variations.

Packet Switching and Access Networks – Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch based networks; Access Networks- Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

High Capacity Networks, Network Design and Management – SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and

demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test bed. Transmission system Engineering-system model, Power penalty-transmitter, receiver, Optical amplifiers, crosstalk, dispersion, wavelength stabilization; overall design consideration; Control and Management-Network manage functions, Configuration management, Performance management, Fault management. Optical safety, Service interface.

REFERENCES:

1. Rajiv Ramaswami and Kumar Sivarajan, “Optical Networks: A practical perspective”, Morgan Kaufmann, 2nd edition, 2001.
2. Vivek Alwayn, “Optical Network Design and Implementation”, Pearson Education, 2004.
3. Keiser G., “Optical fiber communication systems”, McGraw - Hill, 2000.
4. Hussein T. Mouftab and Pin-Han Ho, “Optical Networks: Architecture and Survivability”, Kluwer Academic Publishers, 2002.
5. Biswanath Mukherjee, “Optical Communication Networks”, McGraw Hill, 1997.
6. Ramaswami, Rajiv, Kumar Sivarajan, and Galen Sasaki, “Optical networks: a practical perspective”, Morgan Kaufmann, 2009.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Learn the importance of the backbone infrastructure for our present and future communication needs.
2. Familiarize with the architectures and the protocol stack in use.
3. Understand the differences in the design of routing, switching and the resource allocation methods.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓				✓	✓	✓	✓	✓
CO2	✓	✓	✓						✓	
CO3	✓	✓	✓	✓	✓					

ITITPESCN	CLUSTER COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To be able to understand the Cluster installation and configuration.
- To understand the Parallel programming models & paradigms.
- To familiarize with Job management system and cluster scheduling process.

Overview of cluster computing: Elements of cluster, requirements-classes of cluster- Hardware system structure- Node software- Node hardware: Mother board,

Memory, Basic Input Output Stream-Peripheral Component Interconnect (PCI) bus, Node assembly.

Network Hardware: Interconnecting Technologies, Pitfalls in cluster networks- Network software: sockets, Distributed File System, Remote command execution- Setting up clusters: Cluster configuration, Installation of a node, Basic system administration-Security- NPACI Rocks (Rocks cluster Distribution) - OSCAR Toolkits-Load balancing.

Parallel programming with Message Passing Interface (MPI): MPI compilation and running process, Implementation of MPI for clusters-Dynamic process management-Fault tolerance-RMA- Performance measurement - Parallel Virtual Machine (PVM): Overview, Setup, console details Extended PVM.

Goal of workload management software- management activities-Distributed job scheduler-condor: features, architecture- Installation-Configuration - Administration tools.

Scheduling Parallel jobs on cluster-High performance cluster scheduler: Maui: overview, Installation-Configuration -Overview of Portable Batch System: Architecture, Features and PVFS: Parallel virtual File System-Mapping and scheduling on Heterogeneous system.

REFERENCES:

1. Thomas Sterling, “Beowulf Cluster Computing with Linux”, MIT Press, Second Edition, 2003.
2. Rajkumar Buyya , “High Performance Cluster Computing: Architectures and Systems”, Vol. 1, Prentice Hall PTR, 2007.
3. Rajkumar Buyya, “High Performance Cluster Computing: Programming and Applications”, Vol 2, Prentice Hall PTR, NJ, USA, 1999.
4. Plaza, Antonio J., and Chein-I. Chang, eds. High performance computing in remote sensing. CRC Press, 2007.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Learn the Cluster installation and configuration methods and tools.
2. Understand the Parallel programming models & paradigms.
3. Familiarize the job management system and cluster scheduling process.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO2		✓	✓						✓	
CO3	✓	✓	✓			✓	✓			

ITITPESCN	CLOUD COMPUTING TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To apply trust-based security model to real-world security problems.
- An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.
- Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.

Introduction to Cloud Computing: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

Cloud Computing Architecture: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services, Delivery Model

Cloud Deployment Models : Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in theEnterprise

Security Issues in Cloud Computing : Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security

Identity and Access Management: Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

Security Management in the Cloud: Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS

Privacy Issues : Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

Audit and Compliance : Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud

ADVANCED TOPICS : Recent developments in hybrid cloud and cloud security

REFERENCES:

1. John Rhoton, “Cloud Computing Explained: Implementation Handbook for Enterprises”, Publication Date: November 2, 2009
2. Tim Mather, “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)”, ISBN-10: 0596802765, O'Reilly Media, September 2009

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify security aspects of each cloud model
2. Develop a risk-management strategy for moving to the Cloud
3. Implement a public cloud instance using a public cloud service provider
4. Apply trust-based security model to different layer

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓						✓	✓
CO2			✓	✓			✓			
CO3	✓	✓	✓				✓			✓
CO4		✓	✓				✓			✓

ITITPESCN	GREEN COMPUTING			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To acquire knowledge to adopt green computing practices.
- To understand how to minimize equipment disposal requirements.
- To introduce Socio-cultural aspects of Green IT.

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

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

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

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

REFERENCES:

1. Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011.
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.
3. Alin Gales, Michael Schaefer, Mike Ebbbers, “Green Data Center: steps for the Journey”, Shoff/IBM rebook, 2011.
4. John Lamb, “The Greening of IT”, Pearson Education, 2009.
5. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”, Lulu.com, 2008.
6. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
7. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Minimize negative impacts on the environment.
2. Develop skill in energy saving practices in their use of hardware.
3. Examine technology tools that can reduce paper waste and carbon footprint by user.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓				✓		✓	✓
CO2	✓	✓	✓	✓	✓	✓			✓	✓
CO3	✓	✓	✓	✓				✓		

ITITPESCN	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The course will provide an insight of basic of quantum physics from a computer scientist’s perspective, and how it describes reality and understand the philosophical implications of quantum computing.
- To study about Tensor products and Quantum measurement.
- To introduce recent trends in Quantum Computing theory.

Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt orthogonalization, bra-ket formalism, the Cauchyschwarz and triangle Inequalities.

Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products & matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values & Eigen Vectors, Spectral Decomposition, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators

Commutator Algebra, Heisenberg uncertainty principle, polar decomposition & singular values, Postulates of Quantum Mechanics.

Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices.

Density Operator: Density Operator of Pure & Mix state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce Density Operator, Density Operator & Bloch Vector.

Quantum Measurement Theory: Distinguishing Quantum states & Measures, Projective Measurements, Measurement on Composite systems, Generalized Measurements, Positive Operator- Valued Measures.

Recent trends in Quantum Computing Research, Quantum Computing Applications of Genetic Programming.

REFERENCES:

1. Zdzislaw Meglicki, “Quantum Computing without Magic”
2. DAVID Mc MAHON, “Quantum Computing Explained”
3. Marco Lanzagorta, Jeffrey Uhlmann, “Quantum Computer Science”
4. Phillip Kaye, Raymond Laflamme, Michele Mosca, “An Introduction to Quantum Computing”

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. knowledge of Vector spaces, Matrices, Quantum state, Density operator and Quantum Measurement theory.
2. Understand and explain the basic notions of Quantum Computing - including Quantum Bits and registers, Quantum Evolution, Quantum

Circuits, Quantum Teleportation and the basic Quantum Algorithms known at the present time.

- Identify the essential difference between the classical paradigm and the quantum paradigm of computation and appreciate why quantum computers can solve currently intractable problems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓				✓		✓	
CO2	✓	✓	✓	✓			✓		✓	✓
CO3	✓	✓	✓	✓	✓			✓	✓	

ITITPESCN	CRYPTOGRAPHY AND INFORMATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the mathematics behind Cryptography.
- To understand the standard algorithms used to provide confidentiality, integrity and authenticity.
- To get the knowledge of various security practices applied in the field of information technology.

Overview - Classical Crypto Systems – Substitution Ciphers –Transposition Ciphers- Stream and Block Ciphers – Introduction to Number Theory – Congruences – Chinese Remainder Theorem Modular Arithmetic-Modular Exponentiation – Fermats and Eulers Theorem - Finite Fields –GF(2ⁿ) Fields.

Symmetric Encryption Techniques – DES – AES- Public-Key Cryptography and RSA – Key Management - Diffie-Hellman Key Exchange – Elliptic Curve Cryptography – Symmetric Key Distribution – Kerberos - X.509 Authentication Service - differential cryptanalysis - linear cryptanalysis - side channel attack - lattice reduction attack - Merkle-Hellman knapsack attack - Hellman's time-memory tradeoff (TMTO) attack.

Message Authentication and Hash Functions – Description of MD Hash Family – Secure Hash Algorithms – SHA 512 - Digital Signatures and Authentication Protocols – Digital Signature Standard – Process, Services, Attacks on Digital Signature- Digital Signature Schemes.

Information Security-Statistical database security -Access Control Models - Discretionary Access Control (DAC)-Mandatory Access Control (MAC)- Role-Based Access Control (RBAC); Network and Internet Security-E-mail security-User Safety-Program Security -- Viruses, Worms-Firewalls- Intrusion Detection, Fault tolerance and recovery-Information Warfare-Security Administration.

Multilevel Security- Multilevel Security Architectures- Oracle Virtual Database System- Identification/Authentication-Database Intrusion Control- Survivable Database Systems- Distributed databases- Secure transaction processing - Security

in Data warehousing- Data Mining and Security- Cloud Security- Web Databases- Semi-structured Databases XML Security-Case studies- System Security-Windows security- UNIX security and Security-Enhanced Linux (SELinux)-Web security- Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

REFERENCES:

1. Douglas R. Stinson. Cryptography Theory and Practice (2nd ed). CRC Press, 2002.
2. Alfred J. Menezes, Paul C. van Oorshot, Scott A. Vanstone. Handbook of Applied Cryptography, CRC Press, 1997.
3. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Sixth Edition, 2013.
4. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory”, Second Edition, Pearson Education, 2007.
5. Mark Stamp, “Information Security: Principles and Practice”, Wiley Inter Science, 2011.
6. OWASP top ten security vulnerabilities: <http://xml.coverpages.org/OWASP-TopTen.pdf>
7. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Pearson Education, 2007.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Apply the basic security algorithms required by any computing system.
2. Predict the vulnerabilities across any computing system.
3. Design a security solution for any computing system.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓	✓			
CO2	✓	✓	✓	✓						
CO3		✓	✓	✓	✓				✓	✓

ITITPESCN	WIRELESS COMMUNICATION TECHNIQUES			
	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To understand the issues involved in mobile communication system design and analysis.
- To understand the concept of frequency reuse.
- To understand the characteristics of wireless channels.

Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity –Capacity comparisons – Capacity of Frequency Selective Fading channels.

Fading– Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Inter symbol Interference.

Realization of Independent Fading Paths – Receiver Diversity – Selection Combining – Threshold Combining – Maximal-Ratio Combining – Equal - Gain Combining – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme– Transmit & Receive Diversity-MIMO Systems.

Data Transmission using Multiple Carriers – Multicarrier Modulation with Overlapping Subchannels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak to average Power Ratio-Frequency and Timing offset – Case study IEEE 802.11a.

Frequency Reuse – Channel Assignment Strategies – Hand off Strategies – Interference and system capacity- Co-Channel Interference- Adjacent Channel Interference – Trunking and Grade of service – Improving coverage & capacity in cellular systems-Cell Splitting- Sectoring-Repeaters for Range Extension-Microcell Zone Concept.

REFERENCES:

1. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Wiley Series in Telecommunications, Cambridge University Press, 2005.
2. Theodore.S. Rappaport, “Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, India, 2009.
3. Arogyaswami Paulraj, Rokit Nabar, Dhananjay Gore, “Introduction to Space-Time Wireless Communication”, 1st Edition, Cambridge University Press, 2008.
4. W.C.Y.Lee, “Mobile Cellular Telecommunications - Analog and Digital Systems”, 2nd Edition, Tata McGraw Hill, 2006.
5. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Acquire knowledge in different modulation schemes and its error probability in wireless system.
2. Learn the fundamental limits on the capacity of wireless channels.
3. Understand the diversity concepts.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓	✓			✓
CO2	✓	✓	✓	✓						
CO3	✓	✓	✓	✓						

ITITPESCN	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Internet of Things.
- To get an idea of some of the application areas where Internet of Things can be applied.
- To understand the middleware for Internet of Things.
- To understand the concepts of Web of Things.
- To understand the IOT protocols.

Introduction to ad hoc networks- Differences between cellular and ad hoc wireless networks- Challenges and issues in ad hoc networks-Introduction to WSN- Single node architecture-Network architecture- Localization and positioning- Operating systems for WSN. The DNA of IoT - DCM: Device, Connect, and Manage, Device: Things that Talk, Connect: Via Pervasive Networks, Wired Networks, Wireless Networks Satellite IoT Manage: To Create New Business Value.

Middleware For IoT - Overview of Middleware, Communication Middleware for IoT - MTC/M2M Middleware, SCADA Middleware, RFID Middleware, WSN Middleware. Protocol Standards for IoT - IoT Protocol Standardization Efforts - M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards: A Challenging Task, Unified Identification of Objects.

Web of Things versus Internet of Things - Two Pillars of the Web - Architecture standardization for WoT - Platform Middleware for WoT - Standards for M2M, Frameworks for WSN, Standards for SCADA, Extensions on RFID Standards - Unified Multitier WoT Architecture, SOA/EAI versus SODA/MAI, OSGi: The Universal Middleware, WoT Framework Based on Data Standards - WoT Portals and Business Intelligence, Challenges of IoT Information Security.

Integrated Billing Solutions in the Internet of Things - Cost of RFID and the Internet of Things, Benefits of RFID and the Internet of Things, Cost Benefit Sharing, A Technical Framework for Integrating Billing Capabilities into the EPC global Network - Business Models for the Internet of Things - Business Models and Business Model Innovation - Value Creation in the Internet of Things - Exemplary Business Model Scenarios for the Internet of Things - Product as a Service (PaaS), Information Service Provider, End - User Involvement, Right - time Business Analysis and Decision making.

Ubiquitous IoT Applications - A Panoramic View of IoT Applications - Important Vertical Applications - Telematics and Intelligent Transport Systems, Smart Grid and Electric Vehicles, Smarter Planet and Smart Buildings - Using Internet of Things Concepts to Provide High Interoperability for Logistics Systems - Semantic Web - Ontology - Ontology and the Organizational Perspective, Ontology and the IT - System Perspective, Ontology and the Data Perspective, Ontologies in Multi-agent Systems, The Role of a Top - level Ontology.

REFERENCES:

1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012.
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles - (Eds.) – Springer – 2011.
3. Networks, Crowds, and Markets: Reasoning About a Highly-Connected World - David Easley and Jon Kleinberg, Cambridge University Press – 2010.
4. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley – 2012.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify and design the new models for market strategic interaction.
2. Design business intelligence and information security for WoB.
3. Analyze various protocols for IoT.
4. Design a middleware for IoT.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓			✓	✓		
CO2		✓	✓	✓	✓			✓	✓	✓
CO3	✓	✓	✓	✓						
CO4		✓	✓	✓	✓	✓				✓

ITITPESCN	CROSS – INFORMATICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge about medical informatics and healthcare informatics.
- To understand the case study of computerized patient record.
- To study and use different tools for clinical information system.
- To apply the knowledge of Bio informatics for systems.

Introduction - Structure of Medical Informatics – Internet and Medicine - Security Issues Computer based Medical Information Retrieval, Hospital Management and Information System - Functional Capabilities of a Computerized HIS - E-Health Services - Health Informatics – Medical Informatics – Bioinformatics.

Strategic Planning - Selecting a Health Care Information System - Systems Integration and Maintenance - Systems Integration - Regulatory and Accreditation Issues - Contingency Planning and Disaster Recovery.

Introduction - History taking by Computer, Dialogue with the Computer - Components and Functionality of CPR - Development Tools – Intranet - CPR in

Radiology - Application Server Provider - Clinical Information System - Computerized Prescriptions for Patients.

Automated Clinical Laboratories - Automated Methods in Hematology - Cytology and Histology - Intelligent Laboratory Information System - Computerized ECG, EEG And EMG - Computer Assisted Medical Imaging - Nuclear Medicine - Ultrasound Imaging Ultrasonography - Computed X - Ray Tomography - Radiation Therapy and Planning, Nuclear Magnetic Resonance.

Pair wise Sequence Alignment – Local Versus Global Alignment – Multiple Sequence Alignment – Computational Methods – Dot Matrix Analysis – Substitution Matrices – Dynamic Programming – Word Methods – Bayesian Methods – Multiple Sequence Alignment – Dynamic Programming – Progressive Strategies – Iterative Strategies – Tools – Nucleotide Pattern Matching – Polypeptide Pattern Matching – Utilities – Sequence Databases.

REFERENCES:

1. R.D.Lele, “Computers in Medicine Progress in Medical Informatics”, Tata Mcgraw Hill Publishing Computers, 2005.
2. Mohan Bansal, “Medical informatics”, Tata McGraw Hill Publishing, 2003.
3. Burke, Lillian; Well, Barbara, “Information Technology for the Health Professions”, Prentice Hall, 2006.
4. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.

COURSE OUTCOMES:

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

1. Design and develop clinical and hospital management system on their own.
2. Work with different medical imaging techniques.
3. Apply the knowledge of bio informatics for biological databases. Learn hybrid representations and its Applications.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓			✓		✓	
CO2	✓	✓	✓			✓	✓	✓		
CO3		✓	✓					✓	✓	✓

ITITPESCN	TEXT MINING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic issues and types of text mining.
- To appreciate the different aspects of text categorization and clustering.
- To understand the role played by text mining in Information retrieval and extraction.
- To appreciate the use of probabilistic models for text mining.
- To appreciate the current trends in text mining.

Overview of text mining- Definition- General Architecture- Algorithms- Core Operations - Preprocessing- Types of Problems- basics of document classification- information retrieval- clustering and organizing documents- information extraction- prediction and evaluation-Textual information to numerical vectors -Collecting documents-document standardization- tokenization- lemmatization- vector generation for prediction- sentence boundary determination -evaluation performance.

Text Categorization - Definition - Document Representation -Feature Selection - Decision Tree Classifiers - Rule-based Classifiers - Probabilistic and Naive Bayes Classifiers - Linear Classifiers- Classification of Linked and Web Data - Meta-Algorithms- Clustering -Definition- Vector Space Models - Distance-based Algorithms- Word and Phrase-based Clustering -Semi-Supervised Clustering - Transfer Learning.

Information retrieval and text mining- keyword search- nearest-neighbor methods- similarity- web based document search- matching- inverted lists-evaluation. Information extraction Architecture - Co-reference - Named Entity and Relation Extraction- Template filling and database construction - Applications. Inductive -Unsupervised Algorithms for Information Extraction. Text Summarization Techniques - Topic Representation - Influence of Context - Indicator Representations - Pattern Extraction - A priori Algorithm - FP Tree algorithm.

Probabilistic Models for Text Mining -Mixture Models - Stochastic Processes in Bayesian Nonparametric Models - Graphical Models - Relationship Between Clustering, Dimension Reduction and Topic Modeling - Latent Semantic Indexing - Probabilistic Latent Semantic Indexing -Latent Dirichlet Allocation- Interpretation and Evaluation - Probabilistic Document Clustering and Topic Models - Probabilistic Models for Information Extraction - Hidden Markov Models - Stochastic Context-Free Grammars - Maximal Entropy Modeling - Maximal Entropy Markov Models -Conditional Random Fields.

Visualization Approaches - Architectural Considerations - Visualization Techniques in Link Analysis - Example- Mining Text Streams - Text Mining in Multimedia - Text Analytics in Social Media - Opinion Mining and Sentiment Analysis - Document Sentiment Classification - Opinion Lexicon Expansion - Aspect-Based Sentiment Analysis - Opinion Spam Detection - Text Mining Applications and Case studies.

REFERENCES:

1. Sholom Weiss, Nitin Indurkha, Tong Zhang, Fred Damerau “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”, Springer, paperback 2010.
2. Ronen Feldman, James Sanger, “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”-Cambridge University press, 2006.
3. Charu C. Aggarwal ,ChengXiang Zhai, “Mining Text Data”, Springer, 2012.
4. Weiss, S.M., Indurkha, N., Zhang, T., Damerau, F, “Text Mining Predictive Methods for Analyzing Unstructured Information”, Springer 2004.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the basic concepts of text mining in Information retrieval and extraction.
2. Apply probabilistic models for text mining.
3. Learn the current trends in text mining.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓				✓			✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		
CO3		✓	✓						✓	✓

ITITPESCN	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the concept of how to learn patterns and concepts from data.
- To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- To Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

Supervised Learning (Regression/Classification) : Basic methods: Distance-based methods, Nearest - Neighbours, Decision Trees, Nave Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models - Support Vector Machines, Nonlinearity and Kernel Methods - Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unsupervised Learning : Clustering: K-means/Kernel K-means - Dimensionality Reduction: PCA and kernel PCA - Matrix Factorization and Matrix Completion - Generative Models (mixture models and latent factor models)

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

REFERENCES:

1. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.

COURSE OUTCOMES:

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

1. Extract features that can be used for a particular machine learning approach.
2. Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
3. Analyse various machine learning approaches and paradigms.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓				✓
CO2		✓	✓	✓	✓	✓				
CO3	✓	✓	✓	✓					✓	✓

ITITPESCN	SOFTWARE RELIABILITY ENGINEERING				L	T	P	C
					3	0	0	3

COURSE OBJECTIVES:

- To understand and apply Reliability Mathematics to hardware and software systems.
- To understand evolution of software reliability growth models.
- To understand and apply Non-homogeneous Poisson Software Reliability Growth Models.

Review of Reliability Mathematics–Random Experiment-Probability Distributions Binomial-Poisson-Exponential-Weibul and Generalized Exponential Distributions Reliability Block Diagram-System Reliability-Repairable and Non-Repairable systems Maintainability and Availability-MTBF-MTTF-MDT-MTTR-Designing for higher reliability-Redundancy-k out of n systems.

Basic Concepts – Failure and Faults-Introduction to Software Reliability Growth Models (SRGMs)-General Model Characteristic-Historical Development of models Model Classification scheme-white box and black box models-models for

application during operational phase and testing phase-Markovian models-Jelinski-Moranda model-Goel-Okumoto imperfect debugging model.

Stochastic process-Counting Process-NHPP-Execution Time-Testing time and Calendar Time modeling-Musa models-Basic Execution time-Musa-Okumoto Logarithmic Poisson Execution time models-NHPP models-Goel-Okumoto-Yamada delayed S-shaped model-Log power model-Imperfect debugging models-Kapur-Garg model.

Flexible models-Goel Generalized NHPP-S-G GENHPP- SG We NHPP models Quality metrics producing models- S-G-K (2007) model and S-G-K (2012) model Failure Data-Parameter estimation-MLE and Least squares techniques-Use of tools Comparison Criteria-Goodness of fit - Predictive Validity of Models-short term and long term.

Bayesian models-Littlewood-Verall model-Discrete Models-Efforts based models Release Time determination-criteria-cost-failure intensity-reliability.

REFERENCES:

1. John D. Musa, Anthony Iannino, Kazuhira Okumoto, “Software Reliability – Measurement, Prediction, Application, Series in Software Engineering and Technology”, McGraw Hill, 1987.
2. John D. Musa, “Software Reliability Engineering”, Tata McGraw Hill, 1999.
3. Patric D. T.O Connor, “Practical Reliability Engineering”, 4th Edition, John Wesley & sons, 2003.
4. M.Xie, “Software Reliability Modelling”, World Scientific, Singapore, 1991.

COURSE OUTCOMES:

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

1. Understand the need for flexible models.
2. Understand the quality metrics producing models.
3. Understand Determination of Software Release Time.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓					✓
CO2		✓	✓	✓	✓	✓	✓			
CO3	✓	✓						✓		✓

ITITPESCN	3G AND 4G WIRELESS NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn various generations of wireless and cellular networks.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

Introduction: History of Mobile Cellular Systems - First Generation - Second Generation - Generation 2.5 - Overview of 3G & 4G. 3GPP and 3GPP2 standards.

Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA- CDMA 1X – WCDMA.

LTE: Introduction, Radio interface architecture - Physical layer, Access procedures - System

Architecture Evolution (SAE) - Communication protocols – Interfaces- LTE Advanced.

Introduction to WiMax Networks– IEEE 802.16 – Frame Format – Protocols - OFDM – MIMO - IEEE 802.20 – Applications.

Introduction and Evolution - Applications of DLNA and NFC – DLNA Architecture and Protocol stack - Smart phone and NFC – Mobile Commerce and NFC – NFC tags –Security Issues – Femtocells from the network operators and user ‘s point of view.

REFERENCES:

1. Juha Korhonen, “Introduction to 3G Mobile Communication”, Artech House, 2003.
2. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming , “3G Evolution HSPA and LTE for Mobile Broadband”, Academic Press, 2008.
3. Flavio Muratore, “UMTS Mobile Communication for the Future”, John Wiley & Sons, 2001.
4. Harri Holma and Antti Toskala, “HSDPA/HSUPA for UMTS”, Johan Wiley & Sons, 2006.
5. Martin Sauter, “3G & 4G & Beyond: Bringing Networks, Devices and the Web together”, second edition, Wiley, 2013.

COURSE OUTCOMES:

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

1. Understand Wi MAX networks, protocol stack and standards.
2. Understand the emerging trends of smart phones.
3. Analyze latest standards like DLNA, NFC and femtocells.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓						
CO2		✓	✓	✓	✓		✓		✓	
CO3	✓	✓	✓		✓		✓		✓	✓

ITITPESCN	ADVANCED IMAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts and algorithms of digital processing.
- To familiarize the student with the image processing environments like MATLAB and its equivalent Biometric Image processing environments.
- To expose the students to a broad range of Biometric image processing techniques and issues and their applications, and to provide the student with practical experiences using them.

Digital Image representation - Fundamental steps in Image Processing - Elements of Digital Image Processing Systems - Sampling and Quantization - Basic relationships between pixels - Imaging Geometry - Transformation Technology - The Fourier Transform, The Hadamard Transform, The Discrete Cosine Transform. Image Enhancement: The Spatial Domain Methods, The Frequency Domain Methods - Image Segmentation: Pixel Classification by Thresholding, Histogram Techniques, Smoothing and Thresholding - Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.

Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges -Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification, Matching policies.

Detection and Location of Faces: Statistics-Based method, Knowledge-Based method - Feature Extraction and Face Recognition: Gray value Based method, Geometry Feature Based method, Neural Networks method.

Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location, Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem, Basic Eye Model, Searching Algorithm - Texture Energy Feature.

Introduction to Multibiometric - Information Fusion in Biometrics - Issues in Designing a Multibiometric System - Sources of Multiple Evidence - Levels of Fusion in Biometrics - Sensor level, Feature level, Rank level, Decision level fusion - Score level Fusion.

REFERENCES:

1. David D. Zhang, “Automated Biometrics: Technologies and Systems”, Kluwer Academic Publishers, New Delhi, 2000.
2. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, “Digital Image Processing”, Pearson Education, New Delhi, 2009.
3. Arun A. Ross, Karthik Nandakumar, A.K.Jain, “Handbook of Multibiometrics”, Springer, New Delhi, 2006.
4. Pushpa Dhamala, “Multibiometric systems”, MS thesis, Institute for telematikk, 2012.
5. Anil K Jain, Patrick Flynn, Arun A Ross, “Handbook of Biometrics”, Springer, 2008.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design an application that incorporates different concepts of Biometric Image processing.
2. Apply and explore new techniques in the areas of Biometric image enhancement, restoration, segmentation, compression, wavelet processing and image morphology.
3. Explore the possibility of Applying Biometric image processing concepts in various domains.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓			✓			✓	
CO2	✓	✓	✓	✓	✓				✓	
CO3	✓	✓		✓			✓	✓	✓	✓

ITITPESCN	BIOMETRIC SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide scientific foundations needed for the design, implementation, and evaluation of large scale biometric identification systems.
- To study physiological Biometric technologies.
- To study behavioural biometric technologies and multi Biometrics.

Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.

Physiological Biometric Technologies: Fingerprints - Technical description – characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description - characteristics - weaknesses-deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern - Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics.

Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses- deployment.

Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation Plan.

Case studies on Physiological, Behavioral and multifactor biometrics in identification systems.

REFERENCES:

1. Samir Nanavathi, Michel Thieme, and Raj Nanavathi, “Biometrics -Identity verification in a network”, Wiley Eastern, 2002.
2. John Chirillo and Scott Blaul,” Implementing Biometric Security”, Wiley Eastern Publications, 2005.
3. John Berger,” Biometrics for Network Security”, Prentice Hall, 2004.
4. John D. Woodward, Jr. Nicholas M. Orlans Peter T. Higgins, “Biometrics”, dreamtech, 2003.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design biometric identification systems.
2. Implement biometric identification systems.
3. Evaluate large scale biometric identification systems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓		✓			✓	
CO2	✓	✓					✓	✓		
CO3		✓	✓	✓	✓				✓	✓

ITITPESCN	DISTRIBUTED SYSTEMS SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explore the design and implementation of distributed systems.

Introduction – Distributed Systems, Distributed Systems Security. Security in Engineering: Secure Development Lifecycle Processes - A Typical Security Engineering Process - Security Engineering Guidelines and Resources. Common Security Issues and Technologies: Security Issues, Common Security Techniques.

Host-level Threats and Vulnerabilities: Transient code Vulnerabilities - Resident Code Vulnerabilities - Malware: Trojan Horse – Spyware - Worms/Viruses – Eavesdropping - Job Faults. Infrastructure-Level Threats and Vulnerabilities: Network-Level Threats and Vulnerabilities - Grid Computing Threats and Vulnerabilities – Storage Threats and Vulnerabilities – Overview of Infrastructure Threats and Vulnerabilities.

Application-Layer Vulnerabilities - Injection Vulnerabilities - Cross-Site Scripting (XSS) - Improper Session Management - Improper Error Handling - Improper Use of Cryptography - Insecure Configuration Issues - Denial of Service - Canonical Representation Flaws - Overflow Issues. Service-Level Threats and Vulnerabilities: SOA and Role of Standards - Service-Level Security Requirements -

Service-Level Threats and Vulnerabilities - Service-Level Attacks - Services Threat Profile.

Sandboxing – Virtualization - Resource Management - Proof-Carrying Code - Memory Firewall – Antimalware. Infrastructure-Level Solutions: Network-Level Solutions - Grid-Level Solutions - Storage-Level Solutions. Application-Level Solutions: Application-Level Security Solutions.

Services Security Policy - SOA Security Standards Stack – Standards in Dept - Deployment Architectures for SOA Security - Managing Service-Level Threats - Compliance in Financial Services - SOX Compliance - SOX Security Solutions - Multilevel Policy-Driven Solution Architecture - Case Study: Grid - The Financial Application - Security Requirements Analysis. Future Directions - Cloud Computing Security – Security Appliances - Usercentric Identity Management - Identity-Based Encryption (IBE) - Virtualization in Host Security.

REFERENCES:

1. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnappalli, Niranjan Varadarajan, Srinivas Padmanabhuni and Srikanth Sundarajan, “Distributed Systems Security: Issues, Processes and Solutions”, Wiley Ltd. Publications, 2009.
2. Yang Xiao and Yi Pan, “Security in Distributed and Networking Systems”, World Scientific Publishing Company, 2007.
3. Rachid Guerraoui and Franck Petit, “Stabilization, Safety, and Security of Distributed Systems”, Springer, 2010.
4. Andrew S. Tanenbaum, and Maarten Van Steen, Distributed systems: principles and paradigms. Prentice-Hall, 2007.
5. Oldooz Karimi, "Security model for service-oriented architecture." arXiv preprint arXiv:1108.1314, 2011.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the computer system security.
2. Understand the Security Appliances and Virtualization.
3. Understand the Services Security Policy.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓			✓			✓	
CO2	✓	✓	✓	✓	✓				✓	✓
CO3	✓	✓						✓	✓	

TITPESCN	WIRELESS SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain and understand the complete knowledge of threats within wireless environments.
- To recognize typical vulnerabilities and safeguards for wireless communication to include; Cellular and Personal Communications Services (PCS) network security, secure wireless encrypted e-mail solution, Wireless handheld device security, PAN and LAN security.

Introduction to wireless technologies- Wireless data networks-Personal Area Networks -Transmission Media – WLAN standards - Securing WLANS - Countermeasures - WEP (Wired Equivalence Protocol).

Kinds of security breaches - Eavesdropping - Communication Jamming - RF interference - Covert wireless channels - DOS attack – Spoofing - Theft of services - Traffic Analysis - Cryptographic threats - Wireless Security Standards.

Wireless Device security issues - CDPD security (Cellular Digital Packet Data)-GPRS security (General Packet Radio Service) - GSM (Global System for Mobile Communication) security – IP security.

Secure Socket Layer - Wireless Transport Layer Security - WAP Security Architecture - WAP Gateway.

Basic specifications – Piconets – Bluetooth security architecture – Scatternets – Security at the baseband layer and link layer – Frequency hopping – Security manager – Authentication – Encryption – Threats to Bluetooth security.

REFERENCES:

1. Nichols and Lekka, “Wireless Security-Models, Threats and Solutions”, Tata McGraw – Hill, New Delhi, 2006.
2. Merritt Maxim and David Pollino, “Wireless Security”, Osborne/McGraw Hill, New Delhi, 2005.
3. William Stallings, “Cryptography and Network Security - Principles and practices, Prentice Hall, New Delhi, 2006.
4. Randall, K. Nichols, and Panos C. Lekkas. "Wireless security: models, threats, and solutions." MacGraw-Hill, New York (2002).

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the complete knowledge of threats within wireless environments.
2. Understand the Wireless Device security issues.
3. Understand the basic specifications, Bluetooth security.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓			✓		✓	
CO2	✓	✓	✓				✓		✓	✓
CO3	✓	✓	✓		✓	✓			✓	✓

ITITPESCN	AUDIO PROCESSING				L	T	P	C
					3	0	0	3

COURSE OBJECTIVES:

- To study the characteristics of speech
- To study about speech analysis and synthesis
- To study about Linear Predictive coding, speech coding & Recognition

Principle Characteristics of Speech: Linguistic information, Speech and Hearing, Speech production mechanism, Acoustic characteristic of speech Statistical Characteristics of speech. Speech production models, Linear Separable equivalent circuit model, Vocal Tract and Vocal Cord Model.

Speech Analysis and Synthesis Systems: Digitization, Sampling, Quantization and coding, Spectral Analysis, Spectral structure of speech, Autocorrelation and Short Time Fourier transform, Window function, Sound Spectrogram, Mel frequency Cepstral Coefficients, Filter bank and Zero Crossing Analysis, Analysis – by-Synthesis, Pitch Extraction.

Linear Predictive Coding Analysis: Principle of LPC analysis, Maximum likelihood spectral estimation, Source parameter estimation from residual signals, LPC Encoder and Decoder, PARCOR analysis and Synthesis, Line Spectral Pairs, LSP analysis and Synthesis.

Speech Coding: Reversible coding, Irreversible coding and Information rate distortion theory, coding in time domain: PCM, ADPCM, Adaptive Predictive coding, coding in Frequency domain: Sub band coding, Adaptive transform coding, Vector Quantization, Code Excited Linear Predictive Coding (CELP).

Speech Recognition: Principles of speech recognition, Speech period detection, Spectral distance measure, Structure of word recognition system, Dynamic Time Warping (DTW), Theory and implementation of Hidden Markov Model (HMM).

Speaker recognition: Human and Computer speaker recognition Principles Text dependent and Text Independent speaker recognition systems. Applications of speech Processing.

REFERENCES:

1. Sadaoki Furui, “Digital Speech Processing, Synthesis and Recognition” 2nd Edition, Taylor & Francis, 2000.
2. Rabiner and Schafer, “Digital Processing of Speech Signals”, Pearson Education, 1979.

COURSE OUTCOMES:

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

1. Understand different characteristics of Speech.
2. Identify and analyze different speech analysis system.
3. Write algorithms for Recognition of speech.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓						
CO2		✓	✓	✓	✓	✓	✓		✓	
CO3	✓	✓	✓	✓				✓		✓

ITITPESCN	SENSING TECHNIQUES AND SENSORS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the sensor characteristics and the fundamental principles of sensing.
- To understand the sensor interface electronics.
- To study selected motion-related sensors.
- To study light and radiation detectors.
- To study selected temperature sensors.
- To study selected chemical sensors.

Data Acquisition – sensor characteristics – electric charges, fields, potentials – capacitance – magnetism – inductance – resistance – piezoelectric – pyroelectric – Hall effect – thermoelectric effects – sound waves – heat transfer – light – dynamic models of sensors.

Radiometry – Photometry – mirrors – lenses – fibre optics – concentrators – Interface circuits – amplifiers – light-to-voltage – excitation circuits – ADC – Digitization – Capacitance-to-voltage – bridge circuits – data transmission – noise in sensors and circuits – calibration – low power sensors.

Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors – triboelectric – optoelectronic motion sensors – optical presence sensor – Pressure Gradient sensors Velocity and acceleration sensors: Accelerometer characteristics – capacitative accelerometers – piezoelectric accelerometers – piezo resistive accelerometers – thermal accelerometers – Gyroscopes – piezoelectric cables – gravitational sensors.

Light Detectors: Photo diodes – photo transistor – photo resistor – cooled detectors – CCD and CMOS image sensors – thermal detectors – optical design – gas flame detectors

Radiation Detectors: scintillating detectors – ionization detectors – cloud and bubble chambers.

Temperature Sensors: coupling with objects – temperature reference points – thermo resistive sensors – thermo electric contact sensors – semiconductor sensors – acoustic sensors – piezoelectric sensors
 Chemical sensors: characteristics – classes of chemical sensors – biochemical sensors – multi-sensor arrays – electronic noses and tongues.

REFERENCES:

1. Jacob Fraden, “Handbook of Modern Sensors: Physics, Designs, and Applications”, Fourth Edition, Springer, 2010.
2. Jon Wilson, “Sensor Technology Handbook”, 1st Edition, Elsevier, Dec 2004.
3. D.Patranabis, “Sensors and Transducers”, Prentice Hall of India, 2004.
4. John Vetelino, AravindReghu, “Introduction to Sensors”, CRC Press 2010.
5. John P. Bentley, “Principles of Measurement Systems”, 4th Edition, Pearson Education, 2005.
6. E.A. Doebelin, “Measurement Systems – Applications and Design”, Tata McGraw Hill, New York, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Explain sensor characteristics, physics of sensors, optical components of sensors.
2. Apply sensor interface electronics.
3. Choose and use appropriate motion-related sensors, light and radiation detectors, temperature sensors and chemical sensors.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓		✓						
CO2		✓	✓	✓	✓	✓			✓	✓
CO3	✓	✓	✓				✓		✓	✓

ITITPESCN	ADVANCED WIRELESS AND MOBILE NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The students should get familiar with the wireless/mobile market and the future needs and challenges.
- To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
- To learn how to design and analyse various medium access

- To learn how to evaluate MAC and network protocols using network simulation software tools.
- The students should get familiar with the wireless/mobile market and the future needs and challenges.

INTRODUCTION:

Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

WIRELESS LOCAL AREA NETWORKS:

IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues

WIRELESS CELLULAR NETWORKS:

1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview

WIRELESS SENSOR NETWORKS

Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

WIRELESS PANS

Bluetooth AND Zigbee, Introduction to Wireless Sensors,.

SECURITY

Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.

ADVANCED TOPICS

IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

REFERENCES:

1. Schiller J., Mobile Communications, Addison Wesley 2000
2. Stallings W., Wireless Communications and Networks, Pearson Education 2005
3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002
4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000
5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Design wireless networks exploring trade-offs between wire line and wireless links.
5. Develop mobile applications to solve some of the real world problems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓			✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓		✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4			✓	✓		✓	✓	✓		✓
CO5	✓				✓			✓		

ITITPESCN	DATA WAREHOUSING AND MINING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The objective of this course is to introduce data warehousing and mining techniques.
- Application of data mining in web mining, pattern matching and cluster analysis.
- To study recent trends in Distributed Warehousing and Data Mining.

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;

Mining Data Streams, Methodologies for stream data processing and stream datashystems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis

REFERENCES:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
3. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Study different sequential pattern algorithms
2. Study the techniques to extract patterns from time series data and their application in real world.
3. Extend the graph mining algorithms to web mining
4. Identify the computing framework for Big Data

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓		✓				✓
CO2	✓	✓	✓	✓	✓	✓	✓		✓	✓
CO3	✓	✓	✓	✓		✓			✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓			✓

ITITPESCN	ADVANCED MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce key concepts in pattern recognition and machine learning; including specific algorithms for classification, regression, clustering and probabilistic modeling.
- To give a broad view of the general issues arising in the application of algorithms to analysing data, common terms used, and common errors made if applied incorrectly.
- To demonstrate a toolbox of techniques that can be immediately applied to real world problems, or used as a basis for future research into the topic.

Key concepts, Supervised/Unsupervised Learning, Loss functions and generalization, Probability Theory, Parametric vs Non-parametric methods,

Elements of Computational Learning Theory Ensemble Learning, Bagging, Boosting, Random Forest

Kernel Methods for non-linear data, Support Vector Machines, Kernel Ridge Regression, Structure Kernels, Kernel PCA, Latent Semantic Analysis

Bayesian methods for using prior knowledge and data, Bayesian inference, Bayesian Belief Networks and Graphical models, Probabilistic Latent Semantic Analysis, The Expectation-Maximisation (EM) algorithm, Gaussian Processes

Dimensionality Reduction - CCA, LDA, ICA, NMF – Canonical Variates - Feature Selection vs Feature Extraction

Filter Methods - Sub-space approaches - Embedded methods 9 Low-Rank approaches - Recommender Systems .Application areas - Security - Business - Scientific

Recent trends in supervised and unsupervised learning algorithm, dimensional reducibility, feature selection and extraction

REFERENCES:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning.
2. John Shawe-Taylor and Nello Cristianini, Kernel Methods for Pattern Analysis.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Key concepts, tools and approaches for pattern recognition on complex data sets
2. Kernel methods for handling high dimensional and non-linear patterns
3. State-of-the-art algorithms such as Support Vector Machines and Bayesian networks
4. Solve real-world machine learning tasks: from data to inference
5. Theoretical concepts and the motivations behind different learning frameworks

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓		✓							
CO2	✓	✓	✓	✓		✓			✓	✓
CO3	✓								✓	✓
CO4		✓	✓	✓	✓	✓				
CO5	✓								✓	✓

ITITPESCN	NATURE INSPIRED METAHEURISTIC OPTIMIZATION ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To give students knowledge of non-traditional optimization and fundamentals of metaheuristic optimization algorithms.
- To study about Genetic algorithms, PSO, Artificial Ant and Bee algorithms.
- To introduce multiobjective optimization.

Introduction- Optimization - Search for Optimality-Biological and artificial evolution - Evolutionary computation and AI - brief history of metaheuristics - Simulated Annealing - Annealing and Boltzmann distribution - unconstrained optimization - Constraint handling - method of Lagrange multipliers - penalty approach - repair methods.

Genetic Algorithms: Historical development, GA concepts – encoding, fitness function, population size, selection, crossover and mutation operators, along with the methodologies of applying these operators. Binary GA and their operators, Real Coded GA and their operators - applications to real world problems.

Differential Evolution: DE as modified GA, generation of population, operators and their implementation.

Particle Swarm Optimization: PSO Model, global best, Local best, velocity update equations, position update equations, velocity clamping, inertia weight, constriction coefficients - accelerated PSO.

Artificial Ant and Bee Algorithms: Behaviour of Ants - Ant Colony Optimization- behaviour of honey bees-artificial bee colony optimization.

Harmony Search Optimization - Firefly Algorithm - behaviour of fireflies - light intensity and attractiveness.

Multi-Objective Optimization: Linear and nonlinear multi-objective problems, convex and non – convex problems, dominance – concepts and properties, Pareto – optimality, Use of Evolutionary Computations to solve multi objective optimization, bi level optimization, Theoretical Foundations.

REFERENCES:

1. Coello, C. A., Van Veldhuizen, D.A. and Lamont, G.B.: “Evolutionary Algorithms for solving Multi Objective Problems”, Kluwer. 2002
2. Deb, K.: “Multi-Objective Optimization using Evolutionary Algorithms”, John Wiley and Sons. 2002
3. Deb, K.: “Optimization for Engineering Design Algorithms and Examples”, Prentice Hall of India. 1998
4. Goldberg and David E, "Genetic Algorithms in Search. Optimization and Machine Learning", Pearson Education, New Delhi, 2006.
5. Xin-She Yang, Nature-Inspired Metaheuristic Algorithms, Luniver Press. 2010.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify and describe metaheuristic algorithms and their roles in solving optimization problems
2. Apply the metaheuristic algorithms in solving various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various metaheuristic optimization approaches for a given problem.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓				✓	✓
CO2		✓	✓	✓	✓	✓	✓			
CO3	✓	✓						✓	✓	✓
CO4		✓						✓	✓	✓

ITITPESCN	DIGITAL IMAGE AND VIDEO PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study about Digital Image and Video Fundamentals
- To study about Image and Video Enhancement, Restoration, Segmentation and Compression
- To study about Colour Image processing
- To study about Object Recognition

Digital Image and Video Fundamentals : Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms - Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform

Image and Video Enhancement and Restoration : Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, deinterlacing, video resolution enhancement, Image and Video restoration (recovery).

Image and Video Segmentation : Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.

Colour image Processing : Colour fundamentals, Colour models, Conversion of colour models, Pseudo colour image processing, Full colour processing

Image and Video Compression : Lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, SVC), Video Quality Assessment

Object recognition : Image Feature representation and description-boundary representation, boundary descriptors, regional descriptors, feature selection techniques, introduction to classification, supervised and unsupervised learning, Template matching, Bayes classifier

REFERENCES:

1. Ed. Al Bovik ,”Handbook of Image and Video Processing”, 2nd Edition, Academic Press, 2000.
2. J. W. Woods, “Multidimensional Signal, Image and Video Processing and Coding”,2nd Edition, Academic Press, 2011.
3. Rafael C. Gonzalez and Richard E. Woods,” Digital Image Processing”, 3rd Edition, Prentice Hall, 2008.
 A. M. Tekalp, “Digital Video Processing”, 2nd Edition, Prentice Hall, 2015.
4. S. Shridhar, “Digital Image Processing”, 2nd Edition, Oxford University Press, 2016.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Learn different techniques for image enhancement, video and image recovery
2. Understand techniques for image and video segmentation
3. Study techniques for image and video compression and object recognition

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓				✓	✓
CO2	✓	✓			✓				✓	✓
CO3	✓	✓			✓	✓			✓	✓

ITITPESCN	ETHICAL HACKING AND NETWORK DEFENSE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about ethical hacking
- To understand the hacking networks and vulnerabilities
- To be familiar with hacking applications

ETHICAL HACKING AND SOCIAL ENGINEERING : Introduction - Certified Ethical Hackers – Network and Computer Attacks – Ethical Hacking Plan – Hacking

Methodology. Footprinting Tools – Conducting Competitive Intelligence - DNS Zone Transfers – Introduction to Social Engineering – Performing Social Engineering Attacks – Social Engineering Countermeasures

SERVICE SCANNING : Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps - Shell Scripting. Enumeration: Introduction - Enumerating Windows, Symbian, Java OS, Android and NetWare Operating Systems

HACKING NETWORKS : Hacking Web Servers: Web Application – Web Application Vulnerabilities – Tools for Web Attackers and Security Testers. Hacking Wireless Network: Wireless Technology – Wireless Network Standards – Authentication – Wardriving – Wireless Hacking – Protecting Networks with Security Devices.

HACKING OPERATING SYSTEMS : Windows: Vulnerabilities – Choosing Tools – Information Gathering – RPC – Null Sessions – Share Permissions – Hardcore Vulnerability Exploitation. Linux: Vulnerabilities – Information Gathering – Unconnected Services - .rhosts and hosts.equiv Files – NFS – File Permissions – Buffer Overflow.

HACKING APPLICATIONS : Messaging Systems – Web Applications – Mobile Applications - Databases - Reporting Results

REFERENCES:

1. Michael T. Simpson, “Ethical Hacking and Network Defense”, Cengage Learning, New Delhi, 2010.
2. Kevin Beaver, “Hacking for Dummies”, Wiley Publication, India, 2007.
3. Ankit Fadia, “Unofficial Guide to Ethical Hacking”, Macmillan Company, New Delhi, 2001.
4. Stuart McClure, Joel Scambray and Goerge Kurtz, “Hacking Exposed Network Security Secrets & Solutions”, Tata Mcgrawhill Publishers, 2010.
5. Bensmith, and Brian Komer, “Microsoft Windows Security Resource Kit”, Prentice Hall of India, 2010

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand various ethical hacking and social engineering measures
2. Know about various hacking networks
3. Have an idea about the various vulnerabilities

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓			✓		✓	✓	✓	✓
CO2		✓	✓		✓		✓	✓	✓	✓
CO3	✓		✓	✓	✓	✓	✓	✓		✓

ITITPESCN	DIGITAL FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.

Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case

Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

REFERENCES:

1. John Sammons, "The Basics of Digital Forensics", Elsevier
2. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Laxmi Publications

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand relevant legislation and codes of ethics.
2. Analyze various processes, policies and procedures of computer forensics.
3. Understand E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Gain knowledge on Email and network forensics.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1							✓		✓	
CO2	✓	✓					✓		✓	
CO3	✓	✓				✓	✓		✓	
CO4	✓	✓	✓	✓	✓	✓				✓

ITITPESCN	COMPUTER VISION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Be familiar with both the theoretical and practical aspects of computing with images.
- Have described the foundation of image formation, measurement, and analysis.
- Understand the geometric relationships between 2D images and the 3D world.
- Grasp the principles of state-of-the-art deep neural networks.

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis

Edge detection, Edge detection performance, Hough transform, corner detection

Segmentation, Morphological filtering, Fourier transform

Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing

Pattern Analysis:

Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.

Recent trends in Activity Recognition, computational photography, Biometrics.

REFERENCES:

1. Computer Vision: Algorithms and Applications by Richard Szeliski.
2. Deep Learning, by Goodfellow, Bengio, and Courville.
3. Dictionary of Computer Vision and Image Processing, by Fisher et al.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- a. Understand and master basic knowledge, theories and methods in computer vision.
- b. Identify, formulate and solve problems in computer vision.
- c. Analyze, evaluate and examine existing practical computer vision systems.
- d. Design and develop practical and innovative computer vision applications or systems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓								
CO2		✓	✓							
CO3			✓	✓		✓			✓	
CO4				✓	✓	✓		✓		✓

OPEN ELECTIVES

ITITOESCN	WEB INTEGRATED TECHNOLOGIES	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To understand the issues in the design of web application development.
- To learn the concepts of client side and server side technologies.
- To learn the concept of three tier application using MVC.

Web Engineering and Application Development – Introduction – Challenges and Role of Web Engineering – Web Design Methods – Design Issues – OOWS Model Driven approach – OOHDM – UML based Web Engineering – Designing Multichannel Web Application – Designing Web Application with Web ML and Web Ratio – Semantic Web Information System - Quality Evaluation and Experimental Web Engineering.

Web Technology Basics – HTML5 – Cascading Style Sheet – Client side scripting – JavaScript – JavaScript Objects – XML Basics – DOM – SAX – XSL – AJAX – RSS – Database Connectivity – Server Side Scripting – Servlet – Servlet Life Cycle – Servlet based Web Application – JSP – PHP – ASP.NET – Case Study.

Three Tier Architecture – Working With Model-View-Controller – JCP – J2EE - XML Based APIs – Application Servers - Presentation Tier and EIS Tier – Java Mail – JMS – Java Transactions – JNDI – Java Authentication and Authorization Services – Java Cryptography.

Service Tier And Data Tier – EJB Architecture – Session Beans – Entity Beans – Message Driven Beans – J2EE Connector Architecture - Web Services – J2EE Web Services – Patterns –Presentation, Service Tier and Data Tier Patterns – J2ME - Struts – Hibernate – Spring.

SOA Principles – Evolution of SOA – SOA and WS_Extension – Service Activity – Coordination – Transaction – Orchestration – Choreography – Security – Advanced Messaging - Notification and Eventing - Case Studies – Current Trends.

REFERENCES:

1. Gustavo Rossi, Oscar Pastor, Daniel Schwabe, Luis Olsina, “Web Engineering Modeling and Implementing web Applications”, Springer, 2008.
2. Thomas Erl, “Service Oriented Architecture, Concepts, Technology, and Design”, Pearson,2005.

3. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, “Java Web Services Architecture”, Elsevier, 2003.
4. Freunk P.Coyle, XML, web Services and the Data Revolution, Pearson, 2002.
5. C. Xavier, “Web Technology & Design”, New Age International, 2007.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Design and develop web applications using various models.
2. Develop web application using HTML and scripting technologies.
3. Develop web application with advanced features.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓			✓	✓		✓		✓
CO2	✓	✓	✓		✓	✓		✓		✓
CO3	✓	✓		✓	✓		✓	✓		✓

ITITOESCN	DECISION MANAGEMENT SYSTEMS	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

To understand how Decision Management Systems can transform the business.

To plan the systems with the decision in mind.

To identify, model and prioritize the decisions.

Principles of Decision Management Systems - Begin with the Decision in Mind - Be Transparent and Agile - Be Predictive, Not Reactive - Test, Learn, and Continuously Improve.

Building Decision Management Systems - Discover and Model Decisions - Characteristics of Suitable Decisions - A Decision Taxonomy - Finding Decisions - Documenting Decisions Prioritizing Decisions.

Design and Implement Decision Services - Build Decision Services - Integrate Decision Services - Best Practices for Decision Services Construction - Monitor and Improve Decisions - What Is Decision Analysis? - Monitor Decisions - Determine the Appropriate Response - Develop New Decision-Making Approaches - Confirm the Impact Is as Expected - Deploy the Change.

Enablers for Decision Management Systems - People Enablers - The Three-Legged Stool - A Decision Management Center of Excellence - Organizational Change - Process Enablers - Managing a Decision Inventory - Adapting the Software Development Lifecycle - Decision Service Integration Patterns - Moving to Fact-Based Decisioning - The OODA Loop - Technology Enablers.

Business Rules Management Systems - Predictive Analytics Workbenches - Optimization Systems - Pre-Configured Decision Management Systems - Data Infrastructure - A Service Oriented Platform.

REFERENCES:

1. James Taylor, Decision Management Systems-A Practical guide to using Business rules and Predictive Analytics, IBM Press, 2012.
2. Efraim Turban, Jay E. Aronson, Ting-Peng Liang, Decision Support Systems & Intelligent Systems, 9th edition, Prentice Hall, 2010.
3. Alberto Cordoba, Understanding the Predictive Analytics Lifecycle, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2013.
5. George M Marakas, Decision support Systems, 2nd Edition, Pearson/Prentice Hall, 2002
6. V.S. Janakiraman, K. Sarukesi, —Decision Support Systems”, PHI, ISBN8120314441, 9788120314443, 2004.
7. Efreem G Mallach, —Decision Support systems and Data warehouse Systems, McGraw Hill, thirteenth reprint, 2008.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Design and implement robust decision services.
2. Monitor ongoing decision-making.
3. Learn methods to improve decision making performance.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓		✓	✓	✓		✓	✓		✓
CO2	✓	✓	✓			✓			✓	
CO3	✓		✓	✓			✓		✓	✓

ITITOESCN	CYBER FORENSICS	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To study the fundamentals of computer forensics.
- To have an overview of techniques for Data Recovery and Evidence Collection.
- To study various threats associated with security and information warfare.
- To study the tools and tactics associated with cyber forensics.

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.

Data Recovery Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.

Arsenal – Surveillance Tools – Hackers and Theft of Components – Contemporary Computer Crime Identity Theft and Identity Fraud – Organized Crime & Terrorism Avenues Prosecution and Government Efforts – Applying the First Amendment to Computer Related Crime – The Fourth Amendment and Other Legal Issues.

Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence – Processing Evidence and Report Preparation – Future Issues.

REFERENCES:

1. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Volume1, Cengage Learning, 2005.
2. Marjie T Britz , “Computer Forensics and Cyber Crime: An Introduction”, 3/E,Pearson Education, 2013.
3. Marie-Helen Maras, “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Publishers, 2011.
4. Chad Steel, “Windows Forensics”, Wiley India, 2006.
5. Majid Yar, “Cybercrime and Society”, Sage Publications, 2006.
6. Robert M Slade, “Software Forensics”, Tata Mc Graw Hill, 2004.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Study the fundamentals of computer forensics.
2. Have an overview of techniques for Data Recovery and Evidence Collection.
3. Study various threats associated with security and information warfare.
4. Study the tools and tactics associated with cyber forensics.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓		✓	✓	✓		✓	✓		✓
CO2	✓	✓	✓				✓		✓	✓
CO3	✓		✓	✓			✓		✓	✓
CO4	✓		✓	✓			✓			

ITITOESCN	DATA SCIENCE AND ANALYTICS	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To know the fundamental concepts of data science and analytics.
- To learn various techniques for mining data streams.
- To learn Event Modelling for different applications.
- To know about Hadoop and Map Reduce procedure.

Introduction to Data Science – Applications - Data Science Process – Exploratory Data analysis –Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic

Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

Correlation – Regression – Probability – Conditional Probability – Random Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics.

Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods- Neuro-Fuzzy Modelling – Association rule mining – Clustering – Outlier Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web mining.

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques – Interaction Techniques – Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications.

REFERENCES:

1. XMichael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets” Cambridge University Press, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & Sons, 2012.
4. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.
5. Rachel Schutt, Cathy O’Neil, “Doing Data Science”, O’Reilly Publishers, 2013.
6. Foster Provost, Tom Fawcet, “Data Science for Business”, O’Reilly Publishers, 2013.
7. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014.
8. S. N. Sivanandam, S. N Deepa, “Introduction to Neural Networks Using Matlab 6.0”, Tata McGraw- Hill Education, 2006.

COURSE OUTCOMES:

Upon the completion of the course the student should be able to

1. Work with big data platform and its analysis techniques.
2. Design efficient algorithms for mining the data from large volumes.
3. Apply hadoop architecture.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓			✓		✓	✓			✓
CO2	✓	✓	✓			✓			✓	
CO3						✓	✓			

ITITOESCN	PATTERN RECOGNITION	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To introduce the theoretical fundamentals of recognition.
- To examine variety of recognition models ranging from simple to the more sophisticated.

Review of probability theory: conditional probability, Bayes theorem, random variables, distribution function, expectation and variance, joint distribution function of multiple random variables, normal distribution.

Introduction to pattern recognition system, design cycle, introduction to feature extraction and classification, types of learning. Bayesian decision theory, Bayes Classifier, Discriminant functions, Minimum-error-rate classification.

Parameter estimation methods, Maximum-Likelihood estimation, Gaussian mixture models, Bayesian estimation, Expectation maximization method, Hidden Markov models, Dimension reduction methods, Fisher discriminant analysis, Principal component analysis.

Non-parametric techniques for density estimation and pattern classification, Parzen-window method, K-Nearest Neighbour method, linear discriminant analysis, Support vector machines.

Unsupervised learning and clustering, linear least square regression, Criterion functions for clustering, Algorithms for clustering: Hierarchical and other methods, Cluster validation.

REFERENCES:

1. S. M. Ross, Introduction to Probability models, Academic Press, 2010.
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
4. Nasrabadi, Nasser M. "Pattern recognition and machine learning." Journal of electronic imaging 16.4 (2007): 049901.
5. Anzai, Yuichiro. Pattern recognition and machine learning. Elsevier, 2012.
6. Fu, K. C., ed. Sequential methods in pattern recognition and machine learning. Vol. 52. Academic press, 1968.

COURSE OUTCOMES:

Upon completion of this course the student will be able to

1. Develop the necessary analytical skills and experiences on pattern recognition
2. Understand statistical models of pattern recognition.
3. Learns supervised unsupervised and reinforcement learning.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓		✓	✓			✓
CO2	✓	✓	✓	✓	✓	✓	✓			✓
CO3	✓	✓	✓	✓		✓	✓	✓		✓

ITITOESCN	HUMAN COMPUTER INTERACTION	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Be aware of mobile Human Computer interaction.
- Learn the guidelines for user interface.

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Recent Trends: Speech Recognition and Translation, Multimodal System

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004
2. Brian Fling, “Mobile Design and Development”, First Edition , O’Reilly Media Inc., 2009
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly, 2009.

COURSE OUTCOMES:

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

1. Explain the capabilities of both humans and computers from the view point of human information processing.
2. Describe typical human computer interaction (HCI) models, styles and various historic HCI paradigms.
3. Apply an interactive design process and Universal design principles to design HCI systems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓			✓		✓		✓	
CO2	✓	✓		✓		✓	✓		✓	
CO3			✓	✓	✓	✓		✓		✓

ITITOESCN	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To learn the characteristics of mobile applications.
- To understand the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.

Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.

Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.

REFERENCES:

1. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, “Programming Android”, O’Reilly, 2011.
2. Reto Meier, Wrox Wiley, “Professional Android 2 Application Development”, 2010.
3. Alasdair Allan, “iPhone Programming”, O’Reilly, 2010.
4. Wei-Meng Lee, “Beginning iPhone SDK Programming with Objective-C”, Wrox Wiley, 2010.
5. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and interactions”, Wiley, 2009.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. To learn the characteristics of mobile applications.
2. To understand the intricacies of UI required by mobile applications.
3. To study about the design aspects of mobile application.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓		✓		✓				✓	
CO2	✓	✓	✓	✓	✓		✓		✓	✓
CO3	✓	✓		✓	✓	✓	✓		✓	✓

ITITOESCN	INFORMATION RETRIEVAL	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Information Retrieval with pertinence to modeling, Query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.

Introduction - Goals and history of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR – Basic IR Models Boolean and vector space retrieval models – Ranked Retrieval – Text similarity metrics –TF IDF (term frequency/inverse document frequency) weighting - Cosine Similarity.

Basic Tokenizing - Indexing and Implementation of Vector Space Retrieval - Simple tokenizing – stop word removal and stemming – Inverted Indices –Efficient processing with sparse vectors – Query Operations and Languages - Relevance feedback – Query expansion – Query languages.

Experimental Evaluation of IR Performance Metrics Recall, Precision and F measure – Evaluations on benchmark text collections - Text Representation - Word statistics – Zipf's law – Porter stemmer - Morphology – Index term Selection using thesauri -Metadata and markup languages- Web Search engines – spidering – metacrawlers – Directed spidering – Link analysis shopping agents.

Text Categorization and Clustering - Categorization algorithms - Naive Bayes – Decision trees and nearest neighbor- Clustering algorithms - Agglomerative clustering – k Means – Expectation Maximization (EM) - Applications to information filtering – Organization and relevance feedback.

Recommender Systems - Collaborative filtering - Content based recommendation of documents and products - Information Extraction and Integration - Extracting data from text – XML – semantic web – Collecting and integrating specialized information on the web.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
2. Ricci, F. Rokach, L. Shapira, B. Kantor, P.B. “Recommender Systems Handbook”, 1st Edition, 2011.
3. Brusilovsky, Peter, “The Adaptive Web Methods and Strategies of Web Personalization”, Springer, 2007.
4. Baeza-Yates, Ricardo, and Berthier Ribeiro-Neto. Modern information retrieval. Vol. 463. New York: ACM press, 1999.
5. Crestani, Fabio, Mounia Lalmas, and Cornelis Joost van Rijsbergen, eds. Information Retrieval: Uncertainty and Logics: Uncertainty and Logics: Advanced Models for the Representation and Retrieval of Information. Vol. 4. Springer Science & Business Media, 1998.
6. Heiner Stuckenschmidt, Frank van Harmelen, “Information Sharing on the Semantic Web”, Springer International Edition, ISBN 3-540-20594-2, 2005.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the various applications of Information Retrieval such as Multimedia IR, Web Search.
2. Understand the concepts of digital libraries
3. Understand the collecting and integrating specialized information on the web.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓	✓	✓				✓
CO2	✓	✓	✓	✓	✓		✓			✓
CO3	✓	✓	✓	✓	✓	✓	✓		✓	✓

ITITOESCN	MIDDLEWARE FOR COMMUNICATIONS	L	T	P	C
		2	0	0	3

COURSE OBJECTIVES:

- To understand the middleware technologies and communication protocols for distributed, dependable, and real-time systems.
- To understand the middleware and/or communication protocols.
- To understand a distributed architecture according to distributed communication requirements.
- To understand real-time communication protocols for distributed dependable systems.
- To understand middleware approaches for WSN.

Introduction, what is Middleware, The Evolution of Middleware, Overview of Middleware, Limitations of Conventional Middleware, Middleware Challenges, Categories of middleware: Message oriented middleware.

Transaction Processing Fundamentals Isolation Levels, Optimistic Concurrency Control, Transaction APIs, Container Managed Transactions, Messaging Transactions, Queued Transaction Processing, Web Transactions, Advanced Transactions.

Peer-to-Peer Middleware Peer-to-peer & Grids, Lack of Peer-to-peer Middleware, Peer Groups, Services & Modules, Protocols, Messages & pipes, Security, Quality of Service, Applications using and Enhancing Grid Middleware.

Model Driven Middleware Overview of the OMG Model Driven Architecture (MDA), Capabilities of the MDA, Benefits of the MDA, Overview of Model Driven Middleware, Limitations of Using Modeling and Middleware in Isolation, Combining Model Driven Architecture and QoS-enabled Component Middleware.

Real-time CORBA Middleware: DRE System Technology Challenges, Challenges of Today's DRE Systems, Challenges of Future DRE Systems, Limitations with Conventional DRE System Development, Overview of Real-time CORBA, Overview of CORBA, Overview of Real-time CORBA 1.0, Overview of Real-time CORBA 2.0.

REFERENCES:

1. K. Sohraby, D. Minoli, and T. Znati, "Wireless Sensor Networks: Technology, Protocols, and Applications", John Wiley & Sons, March 2007.
2. Qusay H. Mahmoud, "Middleware for Communications", John Wiley & Sons, 2004.
3. Misra Sudip, Woungam, Isaac Misra, Subhas Chandra, "Guide to wireless sensor networks", Computer Communications and networks Springer link Verlag, 2009.
4. Luis Redondo-López, Aggeliki Prayati, Juan-Manuel LópezNavarro, José-Fernán Martínez-Ortega and Ana-Belén García-Hernando, "Problem solving for wireless sensor networks", Springer Verlag, 2008.
5. Levente Buttyan, Dennis Gessner, Alban Hessler, Peter Langendoerfer "Application of wireless sensor networks in critical infrastructure protection: Challenges and design options", IEEE Wireless Communications, Vol 14 issue 5, Pg.44-49 ,October 2010.
6. Tarik Taleb, Dario Bottazzi and Nidal Nasser, " A Novel Middleware Solution to Improve Ubiquitous Healthcare Systems Aided by Affective Information", IEEE Transactions on Information Technology in Biomedicine, Vol.14, No.2, March 2010.
7. Yoonsik Uhm, Minsoo Lee, "Development of Portable Intelligent Gateway system for ubiquitous entertainment and location – aware Push services" ,IEEE transactions on Consumer electronics, Vol.56, No.1, February 2010.
8. Eduardo Canete, Jaime Chen, Manuel Diaz, Luis Liopis, Bartolome Rubio, "A service oriented approach to facilitate WSN application development", Adhoc networks, Elsevier, 2010.
9. Wouter horre, Sam Michiels, Wouter Joosen, Pierre Verbaeten, Katholieke University, "DAVIM: Adaptable Middleware for Sensor Networks", IEEE distributed systems online vol.9, issue 1, 2008.
10. Min chen, Sergio Gonzalez and Victor C.M.Leung, "Applications and design issues for mobile agents in WSN", IEEE wireless communications, vol 14, issue 6, pages 20-26, December 2007.
11. Hitha Alex Mohan Kumar, Berouoz Shirazi, "Midfusion: An adaptive middleware for information fusion in sensor network applications", Information Fusion, Elsevier. Vol 9, issue no3, Pg no:332-343, 2008.
12. Miaomiao, Jiannong Cao, Jing Li and Sajal K Dasi, "Middleware for Wireless Sensor networks", Journal of Computer Science and Technology, Springer link, Volume no 23, number 3, 305-326, May 2008.
13. References - <http://www.dre.vanderbilt.edu/~schmidt/PDF/>.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Implement the middleware technologies.
2. Implement the communication protocols for distributed communications.
3. Implement the real-time systems.

Mapping with Programme Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓	✓	✓	✓		✓				
CO2	✓	✓	✓	✓	✓					
CO3	✓	✓	✓	✓		✓				✓

AUDIT COURSE – I & II

ITITACSCN	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title
- Ensure the good quality of paper at very first-time submission

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

ITITACSCN	DISASTER MANAGEMENT	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Introduction : Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem.

Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster:

Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Disaster Prone Areas In India : Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

Disaster Preparedness And Management : Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Risk Assessment : Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation : Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., "Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

ITITACSCN	SANSKRIT FOR TECHNICAL KNOWLEDGE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- Enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature
- Alphabets in Sanskrit - Past/Present/Future Tense - Simple Sentences
- Order - Introduction of roots - Technical information about Sanskrit Literature
- Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

REFERENCES:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

ITITACSCN	VALUE EDUCATION	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. - Moral and non- moral valuation. Standards and principles - Value judgements

Importance of cultivation of values - Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness - Honesty, Humanity. Power of faith, National Unity - Patriotism. Love for nature, Discipline

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline - Punctuality, Love and Kindness - Avoid fault Thinking - Free from anger, Dignity of labour - Universal brotherhood and religious tolerance - True friendship - Happiness Vs suffering, love for truth - Aware of self-destructive habits - Association and Cooperation - Doing best for saving nature

Character and Competence –Holy books vs Blind faith - Self-management and Good health - Science of reincarnation - Equality, Nonviolence, Humility, Role of Women - All religions and same message - Mind your Mind, Self-control - Honesty, Studying effectively

REFERENCES:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

ITITACSCN	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

History of Making of the Indian Constitution: History - Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features

Contours of Constitutional Rights & Duties: Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Organs of Governance: Parliament – Composition - Qualifications and Disqualifications - Powers and Functions – Executive – President – Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

Local Administration: District’s Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZilaPachayat - Elected officials and their roles, CEO ZilaPachayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning - Chief Election Commissioner and Election Commissioners - State Election Commission: Role and Functioning - Institute and Bodies for the welfare of SC/ST/OBC and women.

REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

ITITACSCN	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices - Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

Professional development: alignment with classroom practices and follow-up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

Research gaps and future directions : Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272-282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*, Oxford and Boston: Blackwell.
6. Chavan M (2003) *Read India: A mass scale, rapid, 'learning to read' campaign*.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

ITITACSCN	STRESS MANAGEMENT BY YOGA	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To achieve overall health of body and mind
- To overcome stress

Definitions of Eight parts of yog. (Ashtanga)

Yam and Niyam - Do's and Don'ts in life - Ahinsa, satya, astheya, bramhacharya and parigraha - Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES:

1. 'Yogic Asanas for Group Training-Part-I' :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

ITITACSCN	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Neetisatakam - Holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) - Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)

Approach to day to day work and duties - Shrimad BhagwadGeeta : Chapter 2- Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35 - Chapter 18-Verses 45, 46, 48.

Statements of basic knowledge - Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 - Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 - Chapter18 – Verses 37,38,63

REFERENCES:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath
3. Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.