ACADEMIC REGULATIONS & SYLLABUS

(Choice Based Credit System)

Faculty of Technology & Engineering

Master of Technology Programme

Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the choicest destinations by students. It has been transformed into **Charotar University of Science and Technology(CHARUSAT)** through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. of India.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmes, one Institute and an investment of about Rs. 3 Crores (INR 30 million). At present there are seven different institutes falling under ambit of six different faculties. The programmes offered by these faculties range from undergraduate (UG) to Ph.D degrees including M.Phil. These faculties, in all offer 23 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Charotar Institute of Technology	B.Tech M.Tech Ph.D
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B.Pharm M.Pharm Ph.D PGDCT/ PGDPT
Faculty of Management Studies	Indukaka Ipcowala Institute of Management	M.B.A PGDM Ph.D Dual Degree BBA+MBA
Faculty of Computer Applications	Smt. Chandaben Mohanbhai Patel Institute of Computer Applications	M.C.A/MCA (Lateral) M.Sc IT Ph.D Dual Degree BCA+MCA

Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc M.Phil Ph.D Dual Degree B.Sc+M.Sc
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy Manikaka Topawala Institute of Nursing Charotar Institute of Paramedical Sciences	B.PT M.PT Ph.D B.Sc (Nursing) M.Sc GNM Ph.D PGDHA

The development and growth of the institutes have already led to an investment of over Rs.63 Crores (INR 630 Million). The future outlay is planned with an estimate of Rs. 250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 100 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 300 core faculty members, educated and trained in Stanford, IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, **CHARUSAT** has the vision of entering the club of premier Universities initially in the country and then globally. **High Moral Values like Honesty, Integrity and Transparency** which have been the foundation of ECC continue to anchor the functioning of **CHARUSAT**. Banking on the world class infrastructure and highly qualified and competent faculty, the University is expected to be catapulted into top 20 Universities in the coming five years. In order to align with the global requirements, the University has collaborated with internationally reputed organizations like Pennsylvania State University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute –UK, ISRO, BARC, etc.

CHARUSAT has designed curricula for all its programmes in line with the current international practices and emerging requirements. Industrial Visits, Study Tours, Expert Lectures and Interactive IT enabled Teaching Practice form an integral part of the unique **CHARUSAT** pedagogy.

The programmes are credit-based and have continuous evaluation as an important feature. The pedagogy is student-centred, augurs well for self-learning and motivation for enquiry and research, and contains innumerable unique features like:

- Participatory and interactive discussion-based classes.
- Sessions by visiting faculty members drawn from leading academic institutions and industry.
- Regular weekly seminars.
- Distinguished lecture series.
- Practical, field-based projects and assignments.
- Summer training in leading organizations under faculty supervision in relevant programmes.
- Industrial tours and visits.
- Extensive use of technology for learning.
- Final Placement through campus interviews.

Exploration in the field of knowledge through research and development and comprehensive industrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

CHARUSAT welcomes you for a Bright Future

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Master of Technology Programme

(Choice Based Credit System)

Charotar University of Science and Technology (CHARUSAT)
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Year – 2017-18

CHARUSAT

FACULTY OF TECHNOLOGY AND ENGINEERING
ACADEMIC REGULATIONS
Master of Technology (Computer Engineering) Programmes
Choice Based Credit System

To ensure uniform system of education, duration of undergraduate and post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1. System of Education

Choice based Credit System with Semester pattern of education shall be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate and Master's levels. Each semester will be at least 90 working day duration. Every enrolled student will be required to take a course works in the chosen subject of specialization and also complete a project/dissertation if any. Apart from the Programme Core courses, provision for choosing University level electives and Programme/Institutional level electives are available under the Choice based credit system.

2. Duration of Programme

(i)	Postgraduate programme	(MTech)
	Minimum	4semesters (2 academic years)
	Maximum	6 semesters (3 academic years)

3. Eligibility for admissions

Minimum second class is required for admission into M.Tech programme.

4. Mode of admissions

Admission to M Tech programme will be as per Government of Gujarat guidelines. The eligibility norms require a condition to have a bachelor degree in related field and marks obtained in qualifying exam (like GATE) or common entrance test of Government of Gujarat. The detail eligibility norms will be as per Government of Gujarat guidelines.

5. Programme structure and Credits

As per annexure – 1 attached

6. Attendance

6.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

6.2 Student attendance in a course should be 80%.

7 Course Evaluation

7.1 The performance of every student in each course will be evaluated as follows:

7.1.1 Internal evaluation by the course faculty member(s) based on continuous assessment, for 30% of the marks for the course; and

7.1.2 Final examination by the University through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, for 70% of the marks for the course.

7.2 Internal Evaluation

As per Annexure – 1 attached

University Examination

7.2.1 The final examination by the University for 70% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.

7.2.2 **In order to earn the credit in a course a student has to obtain grade other than FF.**

7.3 Performance at Internal & University Examination

7.3.1 Minimum performance with respect to internal marks as well as university examination will be an important consideration for passing a course.
Details of minimum percentage of marks to be obtained in the examinations (internal/external) are as follows:

Minimum marks in University Exam per subject	Minimum marks Overall per subject
40%	50%

7.3.2 A student failing to score 50% of the final examination will get a FF grade.

7.3.3 If a candidate obtains minimum required marks per subject but fails to obtain minimum required overall marks, he/she has to repeat the university examination till the minimum required overall marks are obtained.

8 Grading

8.1 The total of the internal evaluation marks and final University examination marks in each course will be converted to a letter grade on a ten-point scale as per the following scheme:

Table: Grading Scheme (PG)

Range of Marks (%)	≥80	≥75 <80	≥70 <75	≥65 <70	≥60 <65	≥55 <60	≥50 <55	<50
Letter Grade	AA	AB	BB	BC	CC	CD	DD	FF
Grade Point	10	9	8	7	6	5	4	0

8.2 The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are calculated as follows:

(i) SGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses in the semester

(ii) CGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses of all semesters up to which CGPA is computed.

(iii) No student will be allowed to move further if CGPA is less than 3 at the end of every academic year.

9. Awards of Degree

9.1 Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

9.1.1 He should have earned at least minimum required credits as prescribed in course structure; and

9.1.2 He should have cleared all internal and external evaluation components in every course; and

9.1.3 He should have secured a minimum CGPA of 5.0 at the end of the programme;

9.2 The student who fails to satisfy minimum requirement of CGPA at the end of program will be allowed to improve the grades so as to secure a minimum CGPA for award of degree. Only latest grade will be considered.

10. Award of Class

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction: CGPA ≥ 7.5

First class:	CGPA≥ 6.0
Second Class:	CGPA≥ 5.0

II. Transcript

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA,CGPA, class obtained, etc.

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(CHARUSAT)

FACULTY OF TECHNOLOGY & ENGINEERING (FTE)

CHOICE BASED CREDIT SYSTEM

FOR

MASTER OF TECHNOLOGY

A. Choice Based Credit System:

With the aim of incorporating the various guidelines initiated by the University Grands Commission (UGC) to bring equality, efficiency and excellence in the Higher Education System, Choice Based Credit System (CBCS) has been adopted.CBCS offers wide range of choices to students in all semesters to choose the courses based on their aptitude and career objectives. It accelerates the teaching-learning process and provides flexibility to students to opt for the courses of their choice and / or undergo additional courses to strengthen their Knowledge, Skills and Attitude.

1. CBCS – Conceptual Definitions / Key Terms (Terminologies)

1.1. Core Courses

1.1.1 University Core (UC)

University Core Courses are those courses which all students of the University of a Particular Level (PG/UG) will study irrespective of their Programme/specialisation.

1.1.2 Programme Core (PC)

A 'Core Course' is a course which acts as a fundamental or conceptual base for Chosen Specialisation of Engineering. It is mandatory for all students of a particular Programme and will not have any other choice for the same.

1.2 Elective Course (EC)

An 'Elective Course' is a course in which options / choices for course will be offered. It can either be for a Functional Course / Area or Streams of Specialization / Concentration which is / are offered or decided or declared by the University/Institute/Department (as the case may be) from time to time.

1.2.1 **University Elective Course (UE)**

University Elective Courses are those courses which any students of the University of a Particular Level (PG/UG) willchoose as offered or decided by the University from time-to-timeirrespective of their Programme /Specialisation

1.2.2Programme ElectiveCourse (PEC):

A 'Programme Elective Course' is a course forthe specific programme in which students will opt for specific course(s) from the given set of functional course/ Area or Streams of Specialization options as offered or decided by the department from time-to-time

1.2.3Programme Cluster Elective Course (IEC):

A 'Institutional Elective Course' is a course which students can choose from the given set of functional course/ Area or Streams of Specialization options (e.g. Common Courses to EC/CE/IT) as offered or decided by the Institute from time-to-time.

1.3 Non Credit Course (NCC) - AUDIT Course

A 'Non Credit Course' is a course where students will receive Participation or Course Completion certificate. This will not be reflected in Student's Grade Sheet. Attendance and Course Assessment is compulsory for Non Credit Courses.

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
TEACHING AND EXAMINATION SCHEME FOR M TECH
CHOICE BASED CREDIT SYSTEM SCHEME (JULY 2016)

Semester	Course Code	Course Title	Teaching Scheme				Examination Scheme				
			Theory	Practical/ Tutorial	Total	Credit	Theory		Practical		Total
							Internal	External	Internal	External	
Sem 1	IT741	Algorithms & Computational Complexity	3	2	5	4	30	70	25	25	150
	IT742	Advanced Computer Network	3	2	5	4	30	70	25	25	150
	IT743	High Performance Computing	3	4	7	5	30	70	50	50	200
		Programme Elective-I	3	2	5	4	30	70	25	25	150
		Programme Cluster Elective-I	3	2	5	4	30	70	25	25	150
	HS701	University Core-I Advance Critical Thinking & Logic	2	0	2	2	30	70	0	0	100
		University Elective-I	2	0	2	2	30	70	0	0	100
			19	**12**	**31**	**25**	**210**	**490**	**150**	**150**	**1000**
Sem 2	IT744	Information and Network Security	3	4	7	5	30	70	50	50	200
	IT745	Data Science &Modelling	3	2	5	4	30	70	25	25	150
	IT746	Computational Intelligence	3	2	5	4	30	70	25	25	150
		Programme Elective-II	3	2	5	4	30	70	25	25	150
		Programme Cluster Elective-II	3	2	5	4	30	70	25	25	150
	HS702	University Core-II Academic Writing and Communication Skills	0	2	2	2	0	0	30	70	100
		University Elective-II	2	0	2	2	30	70	0	0	100
			17	**14**	**31**	**25**	**180**	**420**	**180**	**220**	**1000**

Semester	Course Code	Course Title	Credit	Examination Scheme					
				Internal		External			Total
				Progress Report	Progress Seminar	Report	Seminar	Viva-voice	
Sem 3	IT811	Project Preliminaries	4	50	50	0	50	50	200
	IT812	Project Phase-I	18	100	100	100	100	100	500
			22						**700**
Sem 4	IT813	Project Dissertation –Phase 2	30	200	200	200	200	200	1000
			30						**1000**
		Grand Total	**102**						**3700**

Semester 1 (Programme Elective-I)		Semester 2 (Programme Elective-II)		Programme Cluster Electives		Sem
IT761	Advanced Operating System	IT764	Web Services & Service Oriented Computing	IT767	Micro device Programming	I
IT762	Information Storage and Retrieval	IT765	Internet of things	IT768	Applied Cryptography	II
IT763	Language Processor	IT766	Cloud Computing	EC767	Embedded System Design	I
				EC768	Digital Image & Speech Processing	II
				CE767	Operating System Design & Concepts	I
				CE768	Software Project Management & Quality Assurance	II
				EE771	Digital Signal Processing & its Application	I
				EE772	Restructuring and deregulation of power system	II

Course Code	Semester 1 (University Elective I)	Course Code	Semester 2 (University Elective II)
MA771	Reliability and Risk Analysis	**EE782**	Energy Audit and Management
EE781	Optimization Techniques	**CE771**	Project Management
ME781	Occupational Health and Safety	**IT771**	Cyber Security and Laws
CE772	Research Methodology	**CA842**	Mobile Application Development
CA730	Internet and Web Designing	**PT796**	Fitness and Nutrition
PT795	Health and Physical Activity	**NR752**	Epidemiology and Community Health
NR751	Women's Health	**OC733**	Introduction to Polymer Science
RD701	Introduction to Analytical Techniques	**MB651**	Software based Statistical Analysis
RD702	Introduction to Nanoscience and Technology	**PH826**	Intellectual Property Rights
MB650	Creative Leadership	**MA772**	Design of Experiments
PH825	Community Pharmacy Ownership		

M. Tech. (Information Technology) Programme

SYLLABI

(Semester – 1)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT741: Algorithms & Computational Complexity

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives to give the subject Design and Analysis of Algorithm are:

- To introduce basic concepts of algorithms, mathematical aspects and analysis of algorithms
- To introduce sorting and searching algorithms and various algorithmic techniques
- To introduce algorithm design methods
- To create analytical skills, to enable the students to design algorithms for various applications, and to analyze the algorithms.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Basics of Analysis of Algorithm	10
2	Divide and Conquer Algorithm	06
3	Greedy Algorithm	06
4	Dynamic Programming	08
5	String Matching	05
6	Complexity Classes and Computational Problems	10

Total hours (Theory): 45 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 75 Hrs.

C. Detailed Syllabus:

1.	**Basics of Analysis of Algorithm**	**10 Hrs**	**22.22%**

What is an algorithm? Mathematics for Algorithm, Elementary Operation, Best Case, Average and Worst case analysis, Asymptotic Notation, Amortized Analysis, Recurrence Equation.

2	**Divide and Conquer Algorithm**	**06 Hrs**	**13.33 %**

The general Template for Divide and Conquer, Problem Solving using divide and conquer algorithm - Binary Search; Sorting (Merge Sort, Quick Sort); Matrix Multiplication; Exponential.

3	**Greedy Algorithm**	**06 Hrs**	**13.33 %**

General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Making change problem; The Knapsack Problem; Job Scheduling Problem, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Dijkstra's Algorithm.

4	**Dynamic Programming**	**08 Hrs**	**17.77 %**

Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient; Making Change Problem; Assembly Line-Scheduling; Knapsack Problem; All Pair Shortest Path; Matrix Chain Multiplication; Longest Common Subsequence, Memory functions.

5	**String Matching**	**05 Hrs**	**11.11 %**

Introduction, The naïve string matching algorithm, The Rabin-Karp algorithm, Knuth-Morris-Pratt Algorithm, Boyer-Moore Algorithm

6	**Complexity Classes and Computational Problems**	**10 Hrs**	**22.22%**

Backtracking, N Queen Problem, Knapsack Problem, Sum of Subset Problem, Assignment Problem, Complexity Classes, NP-Completeness And Reduction, The Class P and NP, Polynomial Reduction, NP- Completeness Problem, NP-Hard Problems, Vertex Cover, Travelling Salesman Problem.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc. Faculty would use the approach teaching with data as it would help to find and integrate real data sets into their classes.
- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.

- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

By taking the course Design and Analysis of Algorithm:

- The students will learn Basic concepts of algorithms, mathematical aspects and analysis of algorithms, sorting and searching algorithms, various algorithmic techniques, algorithm design methods
- Enable the students to design algorithms for various applications, and to analyze the algorithms.

F. Recommended Study Material:

❖ **Text Books:**

1. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein
2. Fundamental of Algorithms by Gills Brassard, Paul Bratley, Publication : PHI

❖ **Reference Books:**

1. Algorithm Design - Foundations, Analysis & Internet Examples by Michael T. Goodrich and Roberto Tamassia
2. Data Structures and Algorithms in Java by Michael T. Goodrich and Roberto Tamassia
3. Data Structures and Algorithms in C++ by Michael T. Goodrich, Roberto Tamassia and David M. Mount
4. Fundamental of Computer Algorithms by Ellis Horowitz, Sartazsahni and sanguthevarRajasekarm

❖ **Reference Links/ e-content:**

1. www.cs.virginia.edu
2. www.cse.unl.edu
3. www.cs.gsu.edu

IT742: ADVANCED COMPUTER NETWORK

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Wireless Communication &Wired Communication are:

- To learn the basics of Wireless voice and data communications technologies.
- To build knowledge on various Mobile Computing algorithms.
- To study the working principles of wired network and its standards.
- To build skills in working with Wireless /Wired application Protocols to develop target application

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Computer Networks and The Internet	06
2.	Application Layer	08
3.	Transport Layer	07
4.	The Network Layer	08
5.	Wireless Communication Fundamentals	05
6	Wireless LAN	08
7	Advance Wireless Communication Standards	03

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Computer Networks and the Internet**	**06 hours**	**13.33 %**
1.1	What is a Protocol?		
1.2	Access Networks		
1.3	Physical Media		
1.4	Packet Switching & Circuit Switching		
2.	**Application Layer**	**08 hours**	**17.78%**
2.1	Principles of Network Applications		
2.2	The Web and HTTP		
2.3	File Transfer: FTP		
2.4	SMTP		
3.	**Transport Layer**	**07 hours**	**15.55%**
3.1	Introduction and Transport-Layer Services		
3.2	Multiplexing and DE multiplexing		
3.3	Connectionless Transport: UDP		
3.4	Principles of Reliable Data Transfer		
3.5	Connection-Oriented Transport: TCP		
4.	**The Network Layer**	**08 hours**	**17.78%**
4.1	Introduction		
4.2	Virtual Circuit and Datagram Networks		
4.3	What's Inside a Router?		
4.4	The Internet Protocol (IP): Forwarding and Addressing in the Internet		
4.5	Routing Algorithms		
5.	**Wireless Communication Fundamentals**	**05 hours**	**11.11%**
5.1	Introduction		
5.2	Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation		
5.3	Multiplexing – Modulations – Spread spectrum		
5.4	MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks		
6	**Wireless LAN**	**08 hours**	**17.78%**
	Wireless LAN – IEEE 802.11 - Architecture – services – MAC –		

Physical layer

IEEE 802.11a - 802.11b – 802.11n standards

Bluetooth,Zigbee

Hipper LAN, Wi-Fi, WiMax - Overview

7	**Advance Wireless Communication Standards**	**03 hours**	**6.67%**

LTE

WiMAX

Delayed tolerant Network

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

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

- Students will learn the fundamentals of Wireless communication and WLAN standards.
- Students will develop "state of the art application" with the use of theoretical and practical knowledge gained in the semester.

F. Recommended Study Material:

Reference Materials:

1. Jochen Schiller, "Mobile Communications", PHI/Pearson Education, Second Edition, 2003.
2. Computer Networking: A Top-Down Approach James F. Kurose, University of Massachusetts, Amherst Keith W. Ross, Polytechnic University, Brooklyn
3. William Stallings, "Wireless Communications and Networks", PHI/Pearson Education, 2002.
4. KavehPahlavan, PrasanthKrishnamoorthy, "Principles of Wireless Networks", PHI/Pearson Education, 2003.
5. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
6. HazysztofWesolowshi, "Mobile CommunicationSystems", John Wiley and Sons Ltd, 2002
7. Research papers from IEEE, Springer etc.
8. Fundamentals of Wireless Communications , David Tse and PramodViswanath, Publisher

Cambridge University Press.

Web Materials:

1. www.ietf.org – For drafts
2. www.ieee.org – For standards and technical research papers
3. http://nptel.iitm.ac.in/courses.php?disciplineId=117

Research papers:

1. Energy-Efficient Routing Protocols in Wireless Sensor Networks: A Survey
2. A survey on routing protocols in Wireless Sensor Network

IT743: HIGH PERFORMANCE COMPUTING

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	4	7	5
Marks	100	100	200	

A. Objective of the Course:

- How to improve quality of program execution for high performance computing platform
- To understand various optimizations and trade-offs.
- To understand various activities that might occur starting from loading a program to termination/completion of a program. Also, learn how programs are managed by hardware and system programs.

Outline of the course:

SrNo.	Title of the unit	Minimum number of Hours
1.	Program execution	05
2.	Computer organization	07
3.	Pipelined processors	05
4.	Virtual memory	06
5.	Cache memory	04
6.	Operating systems	05
7.	Program profiling	04
8.	File systems	04
9.	Parallel architecture	05

Total hours (Theory): 45 Hrs.

Total hours (Lab): 60 Hrs.

Total hours: 105 Hrs.

B. Detailed syllabus

Following contents will be delivered to the students during laboratory sessions.

Sr. No.	Subject content	No. of Hrs.	Weightage in %
1	**Program execution**		
1.1	Program Vs. Process		
1.2	Life Cycle of a process		
1.3	Compilation	**5**	**7%**
1.4	Object files		
1.5	Function call and return		
1.6	Address space		
1.7	Various Data Structures		
1.8	Data and its representation		
2	**Computer organization**		
2.1	Memory(Registers, Cache, RAM)		
2.2	Types of Registers		
2.3	Instruction set architecture(RISC vs CISC)	**7**	18%
2.4	Instruction processing		
2.5	Addressing Modes		
3	**Pipelined processors**		
3.1	Pipelining		
3.2	Structural, data and control hazards	5	10%
3.3	Impact on programming		
3.4	Solutions to the hazards		
4	**Virtual memory**		
4.1	Use of memory by programs		
4.2	Mapping of Logical address to Physical address	6	15%
5	**Cache memory**		
5.1	Organization		
5.2	impact on programming	4	13%
5.3	virtual caches		
5.4	Paging and segmentation.		
6	**Operating systems:**		
6.1	Process and system calls	5	12%
6.2	Process management		
7	**Program profiling**		
7.1	What is program profiling	4	5%
7.2	study of profiling in Linux		
8	**File systems:**		
8.1	Disk management	4	8%
8.2	Name management		
8.3	Protection		

9	**Parallel architecture**		
9.1	Inter-process communication		
9.2	Synchronization	5	12%
9.3	Mutual exclusion		
9.4	Basics of parallel architecture		
9.5	Parallel programming with message passing using MPI		

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C. Instructional method and pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Practical Assignments will be using **MIPS Simulator** tool and **Linux system**.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

D. Student learning outcome:

Prerequisite: Computer programming, Data structures.

By taking this course High Performance computer architecture

- Understand the High Performance Computing.
- Computer System Architectural Design.

F. Recommended study material:

- J. L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.
- Silberschatz, P. B. Galvin, G. Gagne, Operating System Concepts, John Wiley.
- R. E. Bryant and D. R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall.

Reference books:

URL Links:

- http://nptel.ac.in/syllabus/106108055/

IT761: ADVANCED OPERATING SYSTEM(PE-I)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Advanced Operating System are:

- To expose the classic and current operating systems literature.
- To gain experience of conducting research in the area of operating system.
- To acquire and pursue deeper knowledge in the field of operating system.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Basics of operating system	05
2.	The Process and The kernel	08
3.	Threads and Lightweight Processes	08
4.	The Buffer Cache	06
5.	System Calls for the file system	10
6.	Signal and Session Management	04
7.	Case Study: Multiprocessor Systems, Distributed Unix Systems	04

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1. Basics of operating system **05 hours** **12%**

Introduction to an operating system, history of an Operating system, computer hardware review, Operating system Concepts, System Calls

2. The Process and The kernel **08 hours** **19%**

Introduction, architecture of Unix operating system, Mode space and context, The process abstraction, kernel data structure, Executing in kernel mode, System administrator

3. Threads and Lightweight Processes **08 hours** **19%**

Introduction, Fundamental Abstractions, Lightweight Process design, User-level thread libraries, Scheduler Activations, Multithreading in Solaris and SVR4, Threads in Mach, Digital Unix, Mach 3.0 continuations

4. The Buffer Cache **06hours** **13%**

Buffer headers, Structure of the buffer pool, Scenario for retrieval of a buffer, Reading and writing disk blocks, Advantages and disadvantages of buffer cache.

5. System Calls for the file system **08 hours** **19%**

Open, read , write , file and record locking, adjusting the position of File I/O - lseek , close, file creation, creation of special file, change directory and change root, change owner and change mode, STATE and FSTATE, Pipes, Dup, mounting and unmounting file systems, link and unlink, file system abstractions and maintenance

6. Signal and Session Management **04 hours** **9%**

Signal generation and handling, Unreliable signals, Reliable signals, Signals in SVR4, Signals implementations, Exceptions, Mach exception handling, Process groups and Terminal Management, The SVR4 sessions architecture

7. Case Study: Multiprocessor Systems, Distributed Unix Systems **04 hours** **9%**

overview, Solutions with master and slave processors, solutions with semaphore, performance limitation, Satellite Processors, The Newcastle connection, transparent distributed file systems

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc. Faculty would use the approach teaching with data as it would help to find and integrate real data sets into their classes.

- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

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

- Be familiar with the modules of kernel and data structure used for kernel management
- Be familiar with memory management schemes in detail and internal data structures used for memory management
- Be exposed to practical knowledge of thread, signal and system calls for file system at system level
- Be exposed to the various types of operating system at the end
- Be exposed to the basic concepts of data consistency and data consistency models.

F. Recommended Study Material:

❖ **Text Books:**

1. Maurice J. Bach ,"*The Design of the Unix Operating System*", by Tata McGraw Hill
2. Uresh Vahalia, "*UNIX Internals*", Prentice Hall Press

❖ **Reference Books:**

1. Mukesh Singhal and Niranjan Shivaratri, "*Advanced Concepts in Operating Systems: Distributed, Database and Multiprocessor Operating System*", Tata McGraw Hill Publisher.
2. Silberschatz and Galvin, "*Operating Systems Concepts*"
3. Maekawa, Oldehoeft , "*OS:* Advanced *Concepts*", Addison-Wesley.
4. Sape Mullender ,"Distributed *Systems*", Addison-Wesley.
5. Bil Lewis, Daniel J. Berg, "Multithreaded *Programming with Pthreads*"
6. Andrew Tanenbaum and Maarten van Steen, "*Distributed Operating System*" , PHI Publisher

IT762: INFORMATION STORAGE AND RETRIEVAL(PE-I)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Information Storage and Retrieval are:

- To identify the various components of an information storage and retrieval system.
- To become familiar with different models and structures an ISR system may take.
- To understand the theoretical foundations of various ISR methods.
- To be aware of the current research in the field.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction to Information Storage and Retrieval Systems	04
2.	Classic Information Retrieval	06
3.	Document Pre-processing and Search Structure	06
4.	Indexing and Searching	08
5.	Relevance feedback and query expansion	05
6.	Classification and Clustering	08
7.	The Web and Link analysis	08

Total hours (Theory): 45 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 75 Hrs.

C. **Detailed Syllabus:**

1.	**Introduction to Information Storage and Retrieval Systems** Definition, Functional Overview, web crawling and indexes, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.	**04 Hours**	**8.89%**
2.	**Classic Information Retrieval** Basic concepts, Boolean Model, Vector Model, Probabilistic Model.	**06 hours**	**13.33%**
3.	**Document Pre-processing and Search Structure** The term vocabulary, postings lists, Dictionaries and tolerant retrieval.	**06 hours**	**13.33%**
4.	**Indexing and Searching** Index construction, Index Compression, Scoring, term weighting and vector space model, computing score in complete search system.	**08 hours**	**17.78%**
5.	**Relevance feedback and query expansion** Relevance feedback and pseudo relevancefeedback, Local and Global methods for query expansion. Query expansion and term reweighting for Boolean model, vector space model and probabilistic model.	**05 hours**	**11.11%**
6.	**Classification and Clustering** Text classification problem, Naïve Bayes classification, Vector space classification, Support vector machines and machine learning on documents, Introduction to clustering, Flat clustering, Hierarchical clustering.	**08 hours**	**17.78%**
7.	**The Web and Link analysis** Web search basics, Web characteristics, The search user experience, Index size and estimation, Near-duplicates and shingling, The Web as a graph, PageRank, Hubs and authorities.	**08 hours**	**17.78%**

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments on recent research work based on above course content will be given to the students.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

By taking this course Information Storage and Retrieval,

- Students will be able to understand the fundamental of recent research area of Information Storage and Retrieval.
- Students will be able to analyze and understand the different techniques of Information retrieval.
- Students will be able to learn the importance of indexing and clustering techniques applied in Information Storage and Retrieval.

F. Recommended Study Material:

Text Books:

1. Christopher D. Manning,IntroductiontoInformationRetrieval, Cambridge University Press.

Reference Books:

1. Ricardo Baeza-Yates, Modern Information Retrieval, ACM Press.
2. Somasundaram Gnanasundaram, Alok Shrivastava, " Information Storage Management", ISBN : 978-81-265-3750-1, Wiley, India.
3. Gerald J. Kowalski, Mark T. Maybury "Information Storage and Retrieval Systems-Theory and Implementation" Kluwer Academic Publisher, New York

Web Materials:

1. http://repository.upenn.edu/cgi/viewcontent.cgi?article=1864&context=cis_reports
2. http://www.encyclopedia.com/topic/information_storage_and_retrieval.aspx

IT763: LANGUAGE PROCESSOR (PE-I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

B. Objective of the Course:

The main objectives for offering the course Language Processor are:

- To study Language processor and language processing activities.
- To explore design and implement lexical analyzer and parser.
- To explore, design code generation schemes.
- To explore optimization of codes and runtime environment

D. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction To Compilers	04
2.	Analysis phases of Compiler	15
3.	Symbol Table Management	05
4.	Code Optimization	08
5.	Data Flow Analysis & Control Flow Analysis	08
6.	Run Time Environment	05

Total hours (Theory): 45 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 75 Hrs.

E. Detailed Syllabus:

1.	**Introduction To Compilers**	**04 Hours**	**10%**
1.1	Analysis of the source program		
1.2	Phases of compiler		
1.3	Compiler construction tools		
2.	**Analysis phases of Compiler**	**15 hours**	**30%**
2.1	Lexical analysis		
2.2	Syntax analysis & SYNTAX-DIRECTED TRANSLATION		
2.3	Semantic Analysis		
3.	**Symbol Table Management**	**05 hours**	**12%**
3.1	structure, symbol attributes		
3.2	Symbol Table management		
4.	**Code Optimization**	**08 hours**	**18%**
4.1	Early optimizations: Constant-Expression Evaluation (Constant Folding), Scalar Replacementof Aggregates, Algebraic Simplifications and Reassociation, Value Numbering, Copy Propagation, Sparse Conditional Constant Propagation		
4.2	Redundancy Elimination: Common-Subexpression Elimination, Loop-Invariant Code Motion, Partial-Redundancy Elimination, Redundancy Elimination and Reassociation, Code Hoisting		
4.3	Loop optimization: Induction-Variable Optimizations, Unnecessary Bounds-Checking Elimination		
5.	**Data Flow Analysis & Control Flow Analysis**	**08 hours**	**18%**
5.1	Basic Concepts: Lattices, Flow Functions, and Fixed Points, Taxonomy of Data-Flow Problems and Solution Methods, Iterative Data-Flow Analysis, Lattices of Flow Functions, Control-Tree-Based Data-Flow Analysis, Structural Analysis, Interval Analysis, Static Single-Assignment (SSA) Form, Dealing with Arrays, Structures, and Pointers		
5.2	Approaches to Control-Flow Analysis, Depth-First Search, Preorder Traversal, Post order Traversal, and Breadth-First Search, Dominators, Loops and Strongly Connected Components, Reducibility, Interval Analysis and Control Trees,		

Structural Analysis

6. Run Time Environment **05 hours** **12%**

6.1 Source Language Issues

6.2 Storage Organization

6.3 Storage-Allocation Strategies, and Access to Non local Names

6.4 Parameter Passing

6.5 Language Facilities for Dynamic Storage Allocation

6.6 Dynamic Storage Allocation Techniques

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

By taking this course Language Processor,

- Students will be able to simulate Compilation process by using tools such as LEX and YACC & AntLR tool.
- Students will be able to analyse and generate the different parsing techniques.
- Students will be able to perform optimization at different level of program.

F. Recommended Study Material:

Text Books:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and-Tools", Pearson Education Asia.
2. D. M. Dhamdhere, "System Programming and Operating Systems", Tata McGraw-Hill.

Reference Books:

1. Allen I. Holub "Compiler Design in C", Prentice Hall of India.
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings.

3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI.
5. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.
6. Compiler Construction by Kenneth. C. Louden, Vikas Pub.

Web Materials:

1. http://compilers.iecc.com/crenshaw
2. http://www.compilerconnection.com
3. http://dinosaur.compilertools.net
4. http://pltplp.net/lex-yacc

IT767: MICRO DEVICE PROGRAMMING (CT-I)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Advanced Java Programming are:

- To explain the key components of a J2EE, J2ME and Embedded system and understand how they interact.
- To develop an understanding of the various configurations and proper techniques for constructing application which run on Raspberry pi board

B. Outline of the Course:

Sr No.	Title of the unit	Minimum Number of Hours
1	Preparing Development Environment	08
2	Java ME Embedded 8 and Raspberry pi	08
3	Hello World - Java ME Embedded 8 and Raspberry pi	06
4	Raspberry pi GPIO	04
5	Serial Communication - UART	06
6	Raspberry pi I2C-TWT	06
7	Raspberry pi - SPI	03

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1	**Preparing Development Environment**	**08 hours**	**20%**
1.1	Introduction of Embedded System		
1.2	Introduction of Raspberry Pi Board		
1.3	Brief Introduction about JDK, JVM		
1.4	Introduction to RMI, Serializable Classes, Remote Classes and Interfaces, Programming a Client, Programming a Server, Starting the Server, Running a Client, Security		
2	**Java ME Embedded 8 and Raspberry pi**	**08 hours**	**20%**
2.1	Java Me Embedded 8 introduction		
2.2	Installation of Java ME 8		
2.3	Brief Introduction about Netbeans 8		
2.4	Configure Raspberry Pi with Netbeans		
2.5	Deploying FTP server on Raspberry Pi		
3.	**Hello World - Java ME Embedded 8 and Raspberry pi**	**06 hours**	**15%**
3.1	Hardware configuration, Connecting local computer to Raspberry Pi, Building Java ME 8 Application, Debugging an Application		
4	**Raspberry pi GPIO**	**04 hours**	**10%**
4.1	Overview of GPIO		
4.2	Writing data on GPIO		
4.3	Reading data from GPIO		
5	**Serial Communication - UART**	**06 hours**	**15%**
5.1	Raspberry Pi – UART Differentiation		
5.2	Communicating UART with Arduino		
5.3	Building and Testing an Application on Arduino		
6	**Raspberry pi I2C-TWT**	**06 hours**	**15%**
6.1	Hello I2c – Connecting Raspberry pi with Arduino		
6.2	Writing data in I2C		
6.3	Reading from I2C		
6.4	Configuration of I2C in Raspberry Pi, Testing		
7	**Raspberry pi - SPI**	**03 hours**	**05%**
7.1	Configure SPI on Raspberry Pi		

7.2 Develop Hello Application on SPI

7.3 Make Digital to Analog Convertor using Raspberry Pi and SPI

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

- Design, create, test, and maintain J2ME components.
- Apply object oriented analysis and design techniques during development of an application.
- Use the various components like Raspberry Pi, Arduino and SPI involved in developing J2ME applications.
- Configure embedded system application on various board
- Package and deploy a J2ME application. Students will have thorough understanding of JAR, WAR and EAR files.

F. Recommended Study Material:

Text Books:

1. Java Real Time Embedded System Programming, Black Book.
2. Raspberry Pi with Java By Stephen Chin, Macgraw-Hill Publication

Reference Books:

1. Richard Monson-Haefel, J2EE Web Services: XML SOAP WSDL UDDI WS-I JAX-RPC JAXR SAAJ JAXP,Addison-Wesley Professional

Web Material:

1. http://www.oracle.com/technetwork/articles/java/raspberrypi-1704896.html
2. https://www.raspberrypi.org/help/quick-start-guide/
3. http://www.i-programmer.info/news/80-java/7268-java-me-8-released-with-a-big-slice-of-raspberry-pi.html
4. http://www.drdobbs.com/jvm/java-apps-on-the-raspberry-pi/240155309

EC767: EMBEDDED SYSTEM DESIGN (CT-I)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

Embedded systems are generally part of complex systems. An embedded system carries out the Computational subtasks of the main system. The computing systems within home appliances and Automobiles are examples of such systems. This course will cover the process of embedded Computing system design under mainly cost, power, performance and several system- specific Restrictions.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Introduction to Embedded Systems	08
2	Typical Embedded Systems	14
3	RISC microcontrollers	18
4	Embedded product development life cycle	05

Total Hours (Theory):45

Total Hours (Lab): 30

Total Hours:75

C. Detailed Syllabus:

This will provide details about topics under each units of the course.

1	**Introduction to Embedded Systems**	**8Hrs**	**18%**
1.1	History of embedded systems		1hr
1.2	Classification of embedded systems		1hrs
1.3	Major application area of embedded systems		2hrs
1.4	Purpose of embedded systems		1hrs
1.5	Fundamental issues in hardware software co-design		1 hrs
1.6	Introduction to unified modeling language (UML)		2 hrs
2	**Typical Embedded Systems**	**14Hrs**	**30%**
2.1	Core of the Embedded Systems		2hrs
2.2	Memory		3hrs
2.3	Sensors and actuators		4hrs
2.4	Communication interface		3hrs
2.5	Embedded firmware		2hrs
3	**RISC microcontrollers**	**18Hrs**	**40%**
3.1	RISC and CISC architectures		1hrs
3.2	AVR architecture and pin functions		2hrs
3.3	AVR programming in C		3hrs
3.4	I/O interfacing: LED, multiplexed 7-segment, LCD, GLCD, sensors, keypad, relay, buzzer		5hrs
3.5	AVR interrupt programming in C		2hrs
3.6	AVR serial programming in C		2hrs
3.7	Communication protocol: I2C protocol and RTC interfacing, SPI protocol and max7221 interfacing		3hrs
4	**Embedded product development life cycle**	**5Hrs**	**12%**
4.1	Product enclosure design tool		1 hrs
4.2	Product enclosure development techniques		1 hrs
4.3	Objective of EDLC		1 hrs
4.4	Different phases of EDLC and approaches		2 hrs

D. Instructional Method and Pedagogy:

- Multimedia Projector
- OHP

- Chapter wise Assignments
- Quiz
- Chalk + Board
- White Board
- Online Demo

F. Recommended Study Material:

❖ **Text Books:**

1. Introduction to Embedded Systems by shibu K V mcgraw hill
2. The AVR microcontroller and Embedded Systems by muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi

❖ **Reference Books:**

1. System Design: A Unified Hardware/Software Introduction by Frank Vahid and Tony D. Givargis, Addison Wesley, 2002.
2. Computers as Components by Wayne Wolf, Morgan Kaufmann, 2001
3. Embedded C programming and the ATMEL AVR by Barnett, cox and o'cull, Thomson

CE767: OPERATING SYSTEM DESIGN &CONCEPTS (CT-I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objective to give the course Operating System Design and Concepts is:

- To provide an in-depth understanding of how UNIX-based operating system works.
- To understand the concepts of process synchronization and deadlock.
- To understand various Memory management techniques.
- To be aware of latest trends in Operating Systems.

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Basics of operating system	02
2.	The Process and The kernel	08
3.	Threads and Lightweight Processes	04
4.	The Buffer Cache	06
5.	System Calls for the file system	08
6.	Signal and Session Management	06
7.	Interposes Communications	06
8.	Case Study: Multiprocessor Systems, Distributed Unix Systems	05

Total hours (Theory): 45 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 75 Hrs.

C. Detailed Syllabus:

1.	**Basics of operating system** Introduction to an operating system, history of an Operating system, computer hardware review, Operating system Concepts, System Calls	**02Hours**	**4%**
2.	**The Process and The kernel** Introduction, architecture of Unix operating system, Mode space and context, The process abstraction, kernel data structure, Executing in kernel mode, System administrator	**08 Hours**	**18%**
3.	**Threads and Lightweight Processes** Process control, Fundamentals abstraction, Lightweight Process design, User-level threads libraries, Multithreading in Solaris and SVR4, Threads in Mach, Digital Unix, Mac 3.0 continuations	**04Hours**	**8%**
4.	**The Buffer Cache** Buffer headers, Structure of the buffer pool, Scenario for retrieval of a buffer, Reading and writing disk blocks, Advantages and disadvantages of duffer cache.	**06Hours**	**14%**
5.	**System Calls for the file system** Open, read , write , file and record locking, adjusting the position of File I/O - Iseek , close, file creation, creation of special file, change directory and change root, change owner and change mode, STATE and FSTATE, Pipes, Dup, mounting and unmounting file systems, link and unlink, file system abstractions and maintenance	**08Hours**	**18%**
6.	**Signal and Session Management** Single generation and handling, Unreliable single, Reliable single, Singles in SVR4, Signals implementations, Exceptions, Mach exception handling, Process groups and Terminal Management, The SVR4 sessions architecture	**06Hours**	**14%**
7.	**Interprocess Communications** Universal IPC facilities, System V IPC, Mach IPC, Messages, Ports, Message passing, Port operations, Extensibility Mach 3.0 enhancements, discussion	**06Hours**	**14%**
8.	**Case Study: Multiprocessor Systems, Distributed Unix Systems**	**05Hours**	**10%**

overview, Solutions with master and slave processors, solutions with semaphore, performance limitation, Satellite Processors, The Newcastle connection, transparent distributed file systems

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Faculty would use coached problem solving method as it is class format in which faculty provide a structured, guided context for students working collaboratively to solve problems.
- Attendance is compulsory in lectures and laboratory which carries 5% component of the overall evaluation.
- Internal exams or Open-book tests will be conducted and average will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weight age of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

- Students will be able to learn advanced topics in design and implementation of microkernel-based.
- Students will also learn to read and critique research papers.
- Students will be familiar with classic operating systems literature.
- Students will make substantial contributions to the operating systems project

F. Recommended Study Material:

- **Text Books:**
  1. "UNIX Internals" by Uresh Vahalia Prentice Hall Press
  2. "The Design of the Unix Operating System" by Maurice J. Bach Tata McGraw Hill

- **Reference Books:**
  1. Advanced Concepts in Operating Systems, Singhal and Niranjan G.Shivaratna.
  2. OS: Advanced Concepts, Maekawa, Oldehoeft. Addison-Wesley.
  3. "Distributed Systems", Sape Mullender, Addison-Wesley.
  4. Multithreaded Programming with Pthreads, Bil Lewis, Daniel J. Berg.

EE771: DIGITAL SIGNAL PROCESSING & ITS APPLICATION (CT-I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The educational objectives of this course are:

- To classify signals and systems & their mathematical representation
- To analyze the Discrete Time system and to study the various Digital Signal Processing concepts like Discrete Fourier Transform, design of Digital filters which will be useful in relevant applications.
- To motivate and to make the student able to apply the DSP Concepts in Real Time application.

B. Outline of the course:

Sr. No	Title of Unit	Hrs
1.	Introduction to Signals and Systems	10
2.	Realization of Discrete time systems	10
3.	Discrete Fourier Transform	10
4.	Digital Filter Design	15

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1. Introduction to Signals and Systems **10 Hours** **22 %**

Basic elements of Digital Signal Processing System. Advantages of Digital over Analog Signal Processing, Generalized Block diagram of a DSP System,

Continuous-time Vs Discrete time signals, Classification of discrete time Signals, Deterministic and Random Signals, Periodic and Aperiodic signals, Even and odd signals, Exponential and Sinusoidal signals, Causal and Non-Causal signals, Energy and Power Signals, Some Standard signals like Impulse, Step, Ramp and Parabolic.

Basic operations on signals: Shifting, Scaling, Time reversal or Folding, Addition, Subtraction, Multiplication. **Classification of discrete time Systems**: Static and Dynamic Systems, shift-variant and invariant systems, Linear and Non Linear systems, Causal and Non Causal systems, Stable and Unstable systems, impulse response and convolution sum, analytical evaluation of discrete convolution, properties of convolution

2. **Realization of Discrete Time Systems** **10 Hours** **22 %**

Introduction to Z Transform, properties of Z transform, Numerical for Z transform, **Realization of discrete time systems:** basic building block, types of digital system, **Structures for Realization of IIR Systems and numerical**: Direct Form I, Direct Form II, Cascade form, Parallel form, **Structures for Realization of FIR systems and numerical**: Direct Form, Cascade Form Realization

3. **Discrete Fourier Transform** **10 Hours** **22%**

Concepts of frequency in continuous-time and discrete time signals, Discrete Fourier Series: Exponential form, trigonometric form, relation between exponential and trigonometric form of discrete Fourier series, properties of discrete Fourier transform (DFT), Examples, Relation between DFT and Z transform. Numerical to compute DFT of signal, Computational Advantage of Fast Fourier Transform(FFT) Over DFT, Decimation in time (DIT) & Decimation in Frequency (DIF), Algorithm for implementation of FFT: Derivation, Butterfly Diagram & Related Numerical.

4. **Digital Filter Design** **15 Hours** **34 %**

Advantages and disadvantages of digital filter over analog filters,

Classification of filter: low pass, high pass, band pass and band reject (Band Stop), filter specification and Magnitude Characteristics of Low Pass Filter.

Design of IIR filters from analog filters: derivation for impulse invariant & Bilinear transformation method, Analog Butterworth and Chebyshev Filters, Design of digital low pass Butterworth filter and low pass Chebeshev filters, Design of High Pass, Band Pass and Band Reject IIR Filters from Low Pass IIR Filter, Frequency transformation in Analog Domain and Frequency transformation in Digital Domain & Related Numerical

Design ofFIR Filters: Advantages and Disadvantages of FIR Filter, design of FIR filters using windows, various windows for FIR filter and summary, frequency sampling techniques, numerical

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, pre-requisite of the course will be discussed.
- Attendance is compulsory in lectures and laboratory.
- Two internal exams will be conducted as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lecturers.

E. Outcome of the course:

Students will become familiar with the basics of DSP in various areas of Electrical engineering. Many real time complex project demands some sort of signal processing. Student will be taught about the basic concepts of signals, systems and signal processing and usage of tools such as Fourier transform and z-transform & thereby they will be able to process signals further for their application.

F. Recommended Study Material:

Books:

1. V. Udayashankara: ***Real time Digital Signal Processing, Fundamentals, Algorithms and Implementation using TMS Processor,Eastern Economy Edition***
2. A. Anandkumar, ***Digital Signal Processing, PHI Learning Pvt Ltd.***

References:

1. John G. Proakis, Dimitris Manolakis: ***Digital Signal Processing - Principles, Algorithms and Applications, Pearson,*** ISBN 0-13-394289-9
2. Steven T. Karris, ***Signals and Systems with MATLAB Computing and Simulink Modelin,*** Orchard Publications.
3. Lecture Series on Digital Signal Processing by Prof.S. C Dutta Roy, Department of Electrical Engineering, IIT Delhi. For More details on NPTEL visit http://nptel.iitm.ac.in

HS701ADVANCE CRITICAL THINKING AND LOGIC

Credits and Schemes:

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
				Contact Hours/Week	Theory		Practical		Total
					Internal	External	Internal	External	
I	HS701	Advance Critical Thinking and Logic	02	02	30	70	--	--	100

A. Course Objectives

To facilitate learners to:

- critically and logically read, listen, and write
- develop intellectual and personal discipline
- recognize both the need and complexity of good reasoning, logic and critical thinking
- provide intellectual tools for more rigorous self-reflection and critical assessment of other people's arguments
- develop a sense of fairness and respect for opposing positions
- develop advance thinking skills that are applicable to a variety of academic subjects and learners' lives as citizens, consumers, leaders, and moral agents
- improve ability to argue fairly, and to handle bias, emotion, and propaganda
- develop scientific approach of thinking
- develop questioning competencies for logical and critical thinking

B. Course Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**Introduction to Critical Thinking & Logic** • *Concept and Meaning of Thinking & Mind* • *Concept and Meaning of Critical Thinking* • *Concept and Meaning of Logic* • *History of Critical Thinking and Logic*	02
2	**Study of Theories and Critical Thinkers & Logicians** • *Socrates, Aristotle and Contemporary Theorists* • *Asian Critical Thinking Theories*	08
3	**Socratic Questioning** • *Background of Socratic Questioning* • *Importance of Socratic Questioning for Critical Thinking* • *Methods of Socratic Questing & Critical Thinking*	06

4	**Scientific Approach & Critical Thinking** • *Meaning and Concept of Science Approach & Critical thinking* • *Relationship of Critical Thinking to the Scientific Method*	**04**
5	**Logic and Arguments** • *Nature and Concept of Logic and Arguments* • *Application of Arguments for Logical Thinking*	**06**
6	**Contemporary Issues, Critical Thinking & Logic** • *Critical Thinking, Society and Moral Reasoning* • *Case Study*	**04**
	Total	**30**

C. Instruction Methods and Pedagogy

The course is based on pragmatic learning. Teaching will be facilitated by Reading Material, Discussion, Task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations, etc.

D. Evaluation:

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 30 marks for internal evaluation and 70 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
3	Assignment / Project Work	2	25	25
4	Attendance and Class Participation			05
			Total	**30**

External Evaluation

The University Theory examination will be of 70 marks and will test the reasoning, logic and critical thinking skills of the students by asking them theoretical as well as application based questions. The examination will avoid, as far as possible, grammatical errors and will focus on applications. There will be at least one question on case analysis relevant to the components of the course.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

E. Learning Outcomes

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

- Demonstrate the ability to use the elements of thought in developing their thinking process to effectively solve problems and make decisions.
- Consistently apply the critical thinking standards to their thinking process to engage in the process of application, analysis, synthesis, and evaluation in order to make informed and effective decisions.
- Become independent thinker.
- Develop system thinking.
- Develop moral reasoning.
- Apply good reasoning to issues in professional and personal contexts.
- Evaluate evidence and make appropriate inferences from that evidence.
- Determine what evidence is necessary and know how to find that evidence, if possible.
- Construct and defend arguments in support of or in opposition to particular propositions.

F. Reference Books / Reading

- Critical Thinking : Introduction, by Alec Fisher, Cambridge
- Introduction to Logic by Harry J Gensler, Routledge
- http://www.skepdic.com/essays/haskins.pdf
- https://www.palgrave.com/PDFs/1403996857.Pdf
- www.criticalthinking.org
- philosophy.hku.hk/think/critical/ct.php

MA771: RELIABILITY AND RISK ANALYSIS (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical/Tutorial	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course:

The course is designed for Engineers, Mathematician, and Industrial Managers. This course covers basics of Probability and Statistics for prediction of failures in system and quantification of risk

The objectives of the course are to:

1. Understand basics of Probability and Probability distributions
2. Define the system to be analyzed.
3. Identify the system performance measures (Measuring Reliability and Risk)

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction to Probability and Statistics	06
2.	Characteristics of Reliability	06
3.	Reliability of Simple Systems	06
4.	Concept of Safety and Risk Analysis	06
5.	Reliability Modeling	06

Total Hours (Theory): 30

C. **Detailed Syllabus:**

1	**Introduction to Probability and Statistics**	**06 Hours**	**20%**
1.1	Random Event.		
1.2	Basic formula of Probability.		
1.3	Random Variable and Probability Distribution Functions.		
1.4	descriptive statistics		
2	**Characteristics of Reliability**	**06 Hours**	**20%**
2.1	Reliability of a Unit Functioning until First Failure		
2.2	System Reliability		
2.3	Testing for Reliability		
2.4	Exponential Law and Evaluation of parameter		
3.	**Reliability of Simple Systems**	**06 Hours**	**20%**
3.1	Series System		
3.2	Parallel System		
3.3	K out of N systems		
4.	**Concept of Safety and Risk Analysis**	**06 Hours**	**20%**
4.1	Qualitative definition of Risk		
4.2	Quantitative definition of Risk		
4.3	Failure Model and Effect Analysis(FMEA)		
4.4	Hazard and operability analysis(HAZOP)		
4.5	Fault Tree Analysis		
5.	**Reliability Modeling**	**06 Hours**	**20%**
5.1	Software Reliability Analysis		
5.2	Human Reliability		
5.3	Stress-Strength Analysis		

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weighting of 5%.
- Two Quizzes (surprise test) will be conducted which carries 5% component of the overall evaluation.

E. **Student Learning Outcomes:**

- At the end of the course the students will be able to understand the basic concepts of Reliability and Risk Analysis.
- Student will be able to apply concepts of these course in their study of specialization

F. **Recommended Study Material:**

❖ **Text Books:**

1. Mathematical Methods of Reliability Theory. B. V. Gnedenko, Yu. K. Belyayev, and A. D. Solovyev ,Academic Press 1969
2. An Introduction to Basics of Reliability and Risk Analysis. Enric Zio, World Scientific Publishing Co.Pte. Ltd.2007
3. Reliability and Risk Analysis. Terje Aven, Elsevier Publicaion,1992

❖ **Reference Books/Articles:**

1. On The Quantitative Definition of Risk, Stanley Kaplan and B. John Garrick, Risk Analysis, Vol. I, No. I , 1981
2. Probability concepts in engineering planning and design. Volume II – decision, risk and reliability. Ang, A.H.-S. and Tang, W.H John Wiley & Sons, Inc., New York (1984)
3. M. Modarres, Reliability and Risk Analysis, Marcel Dekker (1993).
4. N.J. McCormick, Reliability and Risk Analysis, Academic Press (1981).

EE781: OPTIMIZATION TECHNIQUES (UE-I)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the course:

Optimization techniques, having reached a degree of maturity in recent years, are being used in a wide spectrum of industries, including aerospace, automotive, chemical, electrical, construction, and manufacturing industries. Optimization methods, coupled with modern tools of computer-aided design, are also being used to enhance the creative process of conceptual and detailed design of systems.

The objectives of the course are:

1. To provide an overview of state-of-the-art optimization algorithms and the theoretical principles that underpin them
2. To prepare the students with the modelling skills necessary to describe and formulate optimization problems
3. To introduce methods of optimization to students, including linear programming, network flow algorithms, integer programming, interior point methods, quadratic programming, nonlinear programming, and heuristic methods.
4. To make the students familiar with the applications of various classical and AI methods in solving various complex real-world optimization problems.
5. To introduce the students with software tool to solve optimization problem

B. Outline of the Course:

Sr. No.	Title of Unit	Min. no of hours
1	Fundamentals of Optimization	01
2	Linear Programming	05
3	Unconstrained Optimization	04
4	Nonlinear Programming	05
5	Fundamentals of Artificial Intelligence methods	01
6	Particle Swarm Optimization and Cuckoo Search Algorithm	08
7	MATLAB programming and Optimization Toolbox	06

Total Hours (Theory): 30

C. Detailed Syllabus

1	Fundamentals of Optimization	01 Hours	3.33%

Introduction, Feasibility and optimality, Convexity, constraints, Rates of convergence

2	Linear programming	05 Hours	16.66%

Introduction, Formulation of Linear programming problem, Graphical method, Simplex method, Basic solution, Basic feasible solution, Simplex algorithm, Two phase method.

3	Unconstrained Optimization	04 Hours	13.33%

Introduction, Optimality conditions, Newton's method for minimization, Line search methods, Steepest-Descent method, Quasi-Newton method, Modified newton's method

4	Nonlinear Programming	05 Hours	16.66%

Optimality conditions for constrained problems, Kuhn-Tucker conditions, Penalty function method, Barrier method, The Lagrange multipliers and the Lagrangian function, Sensitivity analysis, Computing the Lagrange multipliers, Sequential quadratic programming, Interior point method

5	Fundamentals of Artificial Intelligence methods	01 Hours	3.33%

To understand importance of AI methods and their comparison with various classical methods using various criteria.

6	Particle Swarm Optimization and Cuckoo Search Algorithm	08 Hours	26.66%

Introduction to PSO, Unconstrained and constrained optimization using PSO, Effects of various coefficients on convergence, Cuckoo Search (CS) Algorithm, Comparison between PSO and CS

7	MATLAB programming and Optimization Toolbox	06 Hours	20%

MATLAB programming of various classical and AI methods. Use of MATLAB optimization toolbox to solve various optimization problems.

D. Instructional Methods and Pedagogy

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures which carries a component of the overall evaluation.
- Minimum two internal exams will be conducted and will be considered as a part of overall evaluation.

- Assignments based on course content will be given to the students for each unit/topic and will be evaluated at regular interval and its weightage may be reflected in the overall evaluation.

E. Student Learning Outcomes:

A. The students will be able to get awareness about the optimization problems. They can differentiate the class of classical optimization methods and AI methods

B. The student will learn to handle, solve and analyzing problems using linear programming and other mathematical programming algorithms

C. The students will also be able to learn different techniques to solve Non- Linear Programming Problems. They can also use search techniques methods, which are based on iterative methods, to find optimal solutions of Non-Linear Programming Problems.

D. Ability to develop codes for evolutionary optimization techniques and to solve wide range of optimization problem.

E. The students will be able to solve optimization methods using software tools such as MATLAB and be prepared for developing case studies and simulation examples

F. Recommended Study Material:

Books:

1. "Optimization Methods for Engineers", N.V.S. Raju, PHI, 2014.
2. "Artificial intelligence and intelligent systems", N.P. Padhy, Oxford University Press, 2005
3. "Engineering Optimization: Theory and Practice", S. Rao, 4th Edition, John Wiley & Sons, Inc., 2009

ME781: OCCUPATIONAL HEALTH AND SAFETY (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course:

- To raise awareness of key health and safety issues in the workplace.
- To provide knowledge of occupational health and safety, emergency planning and environmental management.
- To ingrain the consciousness in students related to occupational health, occupational hygiene, ergonomics, safety and risk management, research methods, and legal studies.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to occupational health and safety	02
2	Occupational safety and management standards, and regulations for health, safety and environment	04
3	Identifying safety and health hazards, and risk analysis	04
4	Occupational physiology and psychosocial factors, and work organization	04
5	Ergonomic workplace design and musculoskeletal diseases	04
6	Control of workplace hazards	04
7	E-waste management	04
8	Work practices in industries and global strategy on occupational safety and health	04

Total Hours (Theory): 30

C. Detailed Syllabus:

1	**Introduction to occupational health and safety**	**02 Hours**	**9%**
	Definition and history of occupational health & safety, workplace hazards.		
2	**Occupational safety & management standards and regulations for health, safety and environment**	**04 Hours**	**13%**
2.1	Factories act and rules; Workmen compensation act. Indian explosive act - Gas cylinder rules - SMPV Act - Indian petroleum act and rules.		
2.2	Environmental pollution act. Manufacturing, storage and import of Hazardous Chemical rules 1989, Indian Electricity act and rules. Overview of OHSAS 18000 and ISO 14000 National legislation and public organizations.		
3	**Identifying safety and health hazards, and risk analysis**	**04 Hours**	**13%**
3.1	Hazard, risk issues and hazard assessment, Introduction to hazard, hazard monitoring-risk issue.		
3.2	Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, preliminary hazard analysis (PHA), hazard operability studies (HAZOP).		
3.3	Computer aided risk analysis, Fault tree analysis & Event tree analysis, Logic symbols, methodology, minimal cut set ranking - fire explosion and toxicity index (FETI), various indices – Hazard analysis (HAZAN).		
3.4	Failure Mode and Effect Analysis (FMEA), Basic concepts of software on risk analysis, CISCON, FETI, ALOHA.		
4	**Occupational physiology, Psychosocial factors and Work organization**	**04 Hours**	**13%**
4.1	Man as system component – allocation of functions – efficiency.		
4.2	Occupational work capacity aerobic and anaerobic work – evaluation of physiological requirements of jobs – parameters of measurements – categorization of job heaviness		
4.3	Work organization – stress – strain – fatigue – rest pauses – shift work – personal hygiene.		
5	**Ergonomic workplace design and Musculoskeletal diseases**	**04 Hours**	**13%**
5.1	Meaning of Ergonomic		
5.2	Meaning of Workplace Design.		
5.3	Musculoskeletal Diseases causes and prevention		
6	**Control of workplace hazards**	**04 Hours**	**13%**
6.1	Workplace hazards and risk control, Transport hazards and risk control,		

Musculoskeletal hazards and risk control, Work equipment hazards and risk control

6.2 Electrical safety, Fire safety, Chemical and biological health hazards and risk control, Physical and psychological health hazards and risk control, Health and safety practical application

7	**E-waste management**	**04 Hours**	**13%**
7.1	Waste characteristics, generation, collection, transport and disposal		
8	**Work practices in industries and global strategy on occupational safety and health**	**04 Hours**	**14%**
8.1	Work practices in industries in manufacturing industries		
8.2	Work practices in industries in service industries		

D. Instructional Method and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- Tutorials related to course content will be given to students.
- In the lectures discipline and behavior will be observed strictly.
- Industrial visits will be organized for students to explore industrial facilities. Students are required to prepare a report on industrial visit and submit as a part of the assignment.

E. Students Learning Outcomes:

- Students will be able to make models for safety at work.
- Students will be able to select safety methods.
- Students will be able to understand how hazardous the process is at work.
- Students will be able to understand proneness of accidents.

F. Recommended Study Material:

❖ **Text Books:**

1. Grimaldi and Simonds , Safety Management, AITBS Publishers , New Delhi (2001)
2. Industrial safety and health, David L. Goetsch, Macmillan Publishing Company,

1993.
3. R.K.Jain and Sunil S.Rao , Industrial Safety, Health and Environment Management Systems, Khanna publishers , New Delhi (2006)
4. Salvendy, G. (2012). Handbook of human factors and ergonomics. John Wiley & Sons.

❖ **Reference Books:**

1. Arezes, P., Baptista, J. S., Barroso, M. P., Carneiro, P., Cordeiro, P., Costa, N., & Perestrelo, G. (Eds.). (2013). Occupational Safety and Hygiene. CRC Press.
2. Chaturvedi, P. (2005). Managing Safety Challanges Ahead. Concept Publishing Company.
3. Healey, B. J., & Walker, K. T. (2009). Introduction to occupational health in public health practice (Vol. 13). John Wiley & Sons.
4. Hester, R. E., & Harrison, R. M. (2009). Electronic waste management (Vol. 27). Royal Society of Chemistry.
5. Karwowski, W., Soares, M. M., & Stanton, N. A. (Eds.). (2011). Human Factors and Ergonomics in Consumer Product Design: Uses and Applications. CRC Press.
6. Khan, B. H. (Ed.). (1997). Web-based instruction. Educational Technology.
7. Roughton, J., & Crutchfield, N. (2011). Job hazard analysis: A guide for voluntary compliance and beyond. Butterworth-Heinemann.
8. Salvendy, G. (Ed.). (2001). Handbook of industrial engineering: technology and operations management. John Wiley & Sons.
9. Smedley, J., Dick, F., & Sadhra, S. (Eds.). (2013). Oxford handbook of occupational health. Oxford University Press.
10. Tillman, C. (2006). Principles of occupational health and hygiene: an introduction. Allen & Unwin.

❖ **Web Material:**

1. International Labour Organization (ILO) http://www.ilo.org/public/english/
2. Occupational Safety & Health Administration United States Department of Laborhttps://www.osha.gov/about.html

❖ **Other Material:**

1. International Journal of Labour Research http://www.ilo.org/actrav/info/pubs/WCMS_158769/lang--en/index.htm
2. International journal of occupational safety And ergonomics (http://archiwum .ciop.pl/757).
3. Journal of Safety and Health at Work (http://www.journals.elsevier.com/safety-and-health-at-work/)

CE772: RESEARCH METHODOLOGY (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course:

Quite frequently these days' people talk of research, both in academic institutions and outside. Several research studies are undertaken and accomplished year after year. But in most cases very little attention is paid to an important dimension that of research methodology. A great deal of research tends to be futile. It may be noted, in the context of planning and development that the significance of research lies in its quality and not in quantity.

- To introduce the basic methods of conducting research, explore ideas in formulating research objectives and hypotheses and sample framework for taking up research studies in a structured manner.
- To facilitate for the development of an insight into different statistical tools for data analysis, interpretation and presentation of reports in different areas of research.
- To enable researchers, irrespective of their discipline, in developing the most appropriate methodology for their research.
- To pay due attention to designing and adhering to the appropriate methodology throughout for improving the quality of research
- To impact higher education in basic areas as well as interdisciplinary areas and to provide researchers a platform to carry out quality research and relevant research.
- To prepare the literature in chronological pattern and logically analyze the concerns.
- To help researchers to use tools, techniques, concepts and world's best practices to present a unique research.
- To frame the research problems to enhance the scale of understanding.
- To give guidance and support to initiate and carry out quality research with a focus on awareness of areas of potential research, guidelines to carry out literature survey in the areas of interest, selection of research area, selection of problem for research and formulation of title, justification of title in current context of research, anticipated

research outcome and its relevance, research methodology to undertake the research, month wise plan for the research work to be carried out, six monthly review of research work of Doctoral Committee with eminent well experience Guides constituted by University etc.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	General introduction to Research	02
2	Research problem Formulation	03
3	Research Design	08
4	Research Publication & Presentation	08
5	Research Ethics and Morals	05
7	Quality indices of research publication	04

Total hours: 30

C. Detailed Syllabus:

1 General introduction to Research **02 Hours 06%**

General Introduction:

Importance of Research, Role of Research, Aims & Objectives, Research Process, Phases of Research. Introduction to Research Methodology: Meaning of Research, Objectives of Research, Motivations in Research, Types of Research, Research Approaches, Significance of Research, Research Methods v/s Methodology, Research and Scientific Methods, Research Process, Criteria of Good Research.

2. Research problem Formulation: **03 Hours 09%**

Review of Research Literature:

Defining the Research Problem: What is Research Problem, Selecting the Problem, Necessity of and Techniques in defining the problem. Purpose and use of literature review, locating relevant information, use of library & electronic databases, preparation & presentation of literature review, research article reviews, theoretical models and frame work. Identification of gaps in research, formulation of research problem, definition of research objectives.

3. Research Design: **08 Hours 27%**

Research Design: Meaning, Need, Features of Good Design, Concepts, Types.

Basic Principles of Experimental Design, Developing a Research Plan.

Qualitative Methods: Types of hypothesis and characterization. *Quantitative Methods:* Statistical methods for testing and evaluation.

Characterization of experiments: Accuracy, reliability, reproducibility, sensitivity, Documentation of ongoing research.

Sample Design: Implication, Steps. Criteria for selecting a sample procedure, Characteristics of Good sampling Procedure, Types of Sample Design, Selecting Random Samples, Complex random sampling Design.

Measurement and Scaling Techniques: Measurement in Research, Measurement Scales, Sources of Errors in measurement, Tests of Second measurement, Technique of developing Measurement Tools, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques.

Methods of Data Collection: Collection of Primary Data, Observation Method, Interview method, Collection of Data through questionnaire and Schedules, Other methods. Collection of Secondary Data, Selection of appropriate method for data collection, Case Study Method, Guidelines for developing questionnaire, successful interviewing. Survey v/s Experiment.

Processing and Analysis of Data : Processing Operations (Meaning, Problems), Data Analysis (Elements), Statistics in Research, Measures of Central Tendency, Dispersion, Asymmetry, Relationship. Regression Analysis, Multiple correlation and Regression, Partial Correlation, Association in case of Attributes.

Sampling Fundamentals: Definition, Need, Important sampling Distribution, Central limit theorem Sampling Theory, Sandler's A-test, Concept of Standard Error, Estimation, Estimating population mean, proportion. Sample size and its determination, Determination of sample size.

Analysis of Variance and Covariance: Basic Principles, techniques, applications, Assumptions, limitations.

Analysis of Non-parametric or distribution-free Tests : Sign Test, Fisher-Irwin Test, McNemer Test, Wilcoxon Matched pair Test (Signed Rank Test).

Sum Tests : a) Wilcoxon-Mann-Whitney Test b)Kruskal-Wallis Test, One sample Runs Test, Multivariate Analysis Techniques: Characteristics, Application, Classification, Variables, Techniques, Factor Analysis

(Methods, Rotation), Path Analysis.

4. **Research Publication & Presentation:** **08 Hours** **27%**

   Thesis, Research paper, Organization of thesis and reports, formatting issues, citation methods, references, effective oral presentation of research, Documentation of ongoing research.

5. **Research Ethics and Morals:** **05 Hours** **19%**

   Issues related to plagiarism and ethics. Intellectual Property Rights: Copy rights, Patents, Industrial Designs, Trademarks.

6. **Quality indices of research publication:** **04 Hours** **12%**

   Impact factor, Immediacy factor.

D. Instructional Method and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- Tutorials related to course content will be given to students.
- In the lectures discipline and behaviour will be observed strictly.
- Industrial visits will be organized for students to explore industrial facilities. Students are required to prepare a report on industrial visit and submit as a part of the assignment.

E. Student Learning Outcomes:

- Research Methodology as a subject should help researchers to prepare the literature in chronological pattern and should logically analyse the concerns.
- This subject should help in framing the research problems to enhance the scale of understanding.
- In this world of global village, research papers are available in abundance; one thesis submitted by a scholar, in no way should be a repetition of a work already done.
- This subject should help researchers to use tools, techniques, concepts and world's best practices to present a unique research.

F. Recommended Study Material:

❖ **Text Books:**

1. Research Methodology, Methods & Techniques, C.R. Kothari, Viswa Prakashan, 2nd Edition, 2009.
2. Research Methods- A Process of Inquiry, Graziano, A.M., Raulin, M.L, Pearson Publications, 7th Edition, 2009.
3. How to Write a Thesis:, Murray, R. Tata McGraw Hill, 2nd Edition, 2010.
4. Writing For Academic Journals, Murray, R., McGraw Hill International, 2009.
5. Writing for Publication, Henson, K.T., Allyn &Bacon, 2005.

❖ **Reference Books:**

1. What is this thing called Science, Chalmers, A.F., Queensland University Press, 1999.
2. Methods &Techniques of Social Research, Bhandarkar & Wilkinson, Himalaya publications, 2009.
3. Doing your Research project, Bell J., Open University Press, Berkshire, 4thEdition, 2005
4. A Handbook of Academic Writing, Murray, R. and Moore, S., Tata McGraw Hill International, 2006.

CA730: INTERNET AND WEB DESIGNING (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course:

- The objective of the course is to provide basic understanding of designing professional web page templates with Markup language. This syllabus also provides the knowledge about publishing website.

Methodology & Pedagogy: During the sessions, topics related to web designing technologies will be covered with suitable examples and students will be required to design and develop entire web sites using several web designing technologies and editors.

Learning Outcome: Upon successful completion of the course, students will understand basic concepts of internet and web page architecture and will be able to develop and host web site by using markup languages and advanced technologies, including HTML and CSS. On completion, student will be able to design and create an advanced website and will be equipped to undertake complex internet projects.

B. Outline of the Course:

Sr. No.	Content
1.	Overview of Internet and WWW, Basic elements of the Internet, Internet services, Internet Browsers and Servers, Hardware and Software requirements to connect to the internet, Internet Service Provider (ISP), Introduction to Internet Protocols
2.	Introduction to Web Page, Web Site, Web Browser, Overview of HTML, Structure of HTML Documents
3.	HTML Basics Tags and HTML elements
4.	List, Marquee & Hyperlink in HTML
5.	Images and Tables in HTML
6.	Forms in HTML
7.	Media Element in HTML5
8.	Introduction to Cascading Style Sheet (CSS), Ways to embed CSS in HTML
9.	CSS selectors & Layout
10.	CSS Properties
11.	Creation of Menu with CSS
12.	Introduction to Web Publishing or Hosting : Domain Name, Web Server, Website Parking, Publishing Website through FTP

D. Total Hours (Theory): 30

❖ **Text Books:**

1. Harley Hahn: The Internet Complete Reference, 2nd Edition, Tata McGraw-HILL Edition.
2. Matthew MacDonald: HTML5: The Missing Manual, O'Reilly Media, August 2011.
3. Peter Gasston: The Book of CSS3: A Developer's Guide to the Future of Web Design, No Starch Press, April 2011.
4. Richard York: Beginning CSS: Cascading Style sheets for Web Design, Wrox Press (Wiley Publishing), 2005.

❖ **Reference Books**:

1. Ivan Bayross: Web Enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP, 4th revised edition, BPB Publication.
2. Adrian Farrel: The Internet and its Protocol – A comparative approach, Morgan Kaufmann Publishers.
3. David Mc Farland: CSS: The Missing Manual, O'Reilly, 2006.

❖ **Reference Links**:

1. http://www.w3schools.com [lecture notes]
2. http://www.whatwg.org/specs/web-apps/current-work/multipage/#auto-toc-4 [HTML Materials]
3. http://people.cs.pitt.edu/~mehmud/cs134-2084/lectures.html [CSS notes]

PT795: HEALTH AND PHYSICAL ACTIVITY (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the course:

This course will make the student to understand health and physical activity and the impact inactivity have on his/her health. Health and physical activity constitute major components of a healthy lifestyle and general health promotion and protection. The knowledge and experience gained from health and physical activity course will enable students to make informed decisions about their health as it relates to quality of life and longevity.

Upon completion of this course, the student should be able to:

1. Understand the health-related benefits of physical activity and risks associated with physical inactivity
2. Comprehend the principles specific to attaining and maintaining good health and fitness throughout the lifespan
3. Realize the areas of nutrition, cardiovascular health, diseases related to physical activity, stress management, substance use and abuse, and sexually transmitted diseases.

B. Outline of the course:

S. No.	Title of the unit	Minimum number of hours
1.	Introduction to health	10
2.	Physical Activity	10
3.	Introduction to Yoga	10

Total Hours (Theory): 30

C. Detailed Syllabus:

1	**Introduction to Health**	**10 hours**
1.1	What is health?	
1.2	Healthcare delivery system: Developing Countries, Developed Countries	
1.3	Human anatomy, physiology & physical fitness	
1.4	Basics of Nutrition	
1.5	Life style disorders – obesity & diabetes	
2	**Physical Activity**	**10 hours**
2.1	What is Physical activity, exercise, physical fitness, epidemiology?	
2.2	Measurement of Physical Activity in individuals	
2.3	Physical Activity – Theoretical Perspective: Self-determination, trans theoretical	
2.4	Physical Activity and mental health – Body image, depression, problem with exercise	
2.5	Barriers & Facilitators of Physical Activity	
3	**Introduction to Yoga**	**10 hours**
3.1	What is yoga?	
3.2	Types of yoga	
3.3	Benefits of yoga to various body systems	
3.4	Asanas, Pranayam	
3.5	Yoga therapy for various back pain, asthma, stress, hypertension, diabetes	

D. Instructional Method and Pedagogy:

- Interactive classroom sessions using black-board and audio-visual aids.
- Using the available technology and resources for e-learning.
- Students will be encouraged towards self-learning and under direct interaction with course faculty.
- Students will be enabled for continuous evaluation.
- Case study, didactic mode of group discussions

E. Student Learning Outcomes:

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

- Appraise the importance of exercise in maintenance of health and fitness.
- Objectively define health and physical activity in realistic environment.

F. Recommended Study Material:

- **Textbooks:**
  1. ACSM"s "Health Related Physical Fitness Assessment Manual Lippincott Williams and Walkins USA, 2005.
  2. Nilima Patel (2008) Yoga and Rehabilitation, Jaypee Publication, India
- **Reference books:**
  1. Biddle, S. J. H., & Mutrie, N. (2008). Psychology of physical activity. London: Routledge
  2. B.C. Rai. Health Education and Hygiene Published by Prakashan Kendra
  3. Puri. K. Chandra. S.S. (2005). Health and Physical Education. New Delhi: Surjeet Publications

NR751: WOMEN'S HEALTH (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Course Objectives:

Upon completing the course, students will be able to

- Understand and describe the sociocultural, behavioral, and policy issues that contribute to and affect women's health at National and International Level.
- Describe the seven domains of health and their impact on women.
- Understand the value and limitations of various tools that are used to measure and monitor women's health.
- Identify major demographic, behavioral and environmental factors that are associated with women's health and how such factors may be incorporated into public health interventions, programs, and policies.
- Identify trends in major health conditions that affect women.
- Identify the interplay between health services delivery and policy issues as they impact and are impacted by health issues.

B. Outline of the Course:

Unit No.	Title of Unit	Prescribed Hours
I.	**Overview of Women Health in India**: • Women's health nationally and locally. • Women's health and the seven domains of health. • Policy initiatives related to women's health issues, as related to cost, monitoring, measures of success and impact on other policy initiatives.	3
II.	**Female Anatomy & Physiology**: • Female anatomy and physiology from the perspective of their effects on women's health, including differences from men's health • Menstrual and menopause	5
III.	**Women and relationships**: Family, social networks and exposure to intrapersonal violence: • Social meaning for women's lives • Social policies relating to women in the INDIA • Health policies relating to women • violence that affect women's lives & medical issues	5
IV.	**Non Communicable Diseases** :	10

	• Introduction of Non Communicable diseases in relation to women health • Cardiovascular Diseases: ➢ Women's risk factors for cardiovascular disease ➢ Gender differences in prognosis for and treatment of cardiovascular disease in women. ➢ Interactions between knowledge, risk, and outcomes of cardiovascular disease in women • Cancer: ➢ Most common cancers in women (excluding minor skin cancers) in terms of diagnoses as well as deaths. ➢ Levels of cancer prevention. ➢ Public health approach to screening for cancer	
V.	Mental Health/ Substance use	2
VI.	Act & Laws : Indian legislations and law regarding Women protection (Human Rights)	5
	Total	**30 Hours**

C. Instruction Method and Pedagogy

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, microteaching, task-based learning, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

D. Evaluation: The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 25 marks for internal evaluation and 75 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Assignments	1	8	8
2	Internal Test/ Model Exam	1	12	12
3	Attendance and Class Participation	Minimum 80% attendance		10
			Total	**30**

External Evaluation

The University Theory examination will be of 75 marks and will test the logic and critical thinking skills of the students by asking them theoretical as well as application based questions. The examination will avoid, as far as possible, grammatical errors and will focus on applications.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

E. **Learning Outcomes:** At the end of the course, learners will be able to:

- Understand the sociocultural, behavioral, and policy issues that contribute to and affect women's health at National and International Level.
- Understand the seven domains of health and their impact on women.
- Understand the value and limitations of various tools that are used to measure and monitor women's health.
- Understand trends in major health conditions that affect women.
- Understand the health services delivery and policy issues which impact on women's health.

RD701: INTRODUCTION TO ANALYTICAL TECHNIQUES (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the course.

- The objective of the course is to introduce students to different types of experimental techniques available.
- This course will expose student to state of art equipments and their utility.
- The emphasis is given more on analyzing of the data and operating skills.
- To explore the basics of Chromatography

B. Outline of the Course

Sr. No.	Title of Unit	No. of hrs.
1.	HPLC	08
2.	TGA-DSC	09
3.	DLS	05
4.	PCR	08

Total Hours (Theory): 30

C. Syllabus Topics:

Sr. No.	Title of Unit	Topics
1.	High Performance Liquid Chromatography (HPLC)	Introduction to HPLC, Basic Principle of HPLC, Instrumentation for HPLC, Types of Detector used in HPLC, Column efficiency in liquid chromatography
2.	TGA-DSC	General Discussion, Thermogravemetry Analysis, Instruments available for Thermogravimetric analysis, Detailed Discussion, Principle and Applications in various fields of Science and Engineering. Data Analysis
3.	DLS	Concept of Dynamic light scattering and basics of Particle size analyzer, Data Analysis and applications of DLS

4.	PCR	Introduction and principle of Polymerase Chain Reaction (PCR), Principle of PCR, Primer designing, Detailed methodology of PCR, Modifications of PCR, Applications of PCR

D. Instructional Methods and Pedagogy:

The topics will be discussed in interactive class room sessions using classical black-board teaching to power-point presentations. Unit tests will be conducted regularly as a part of continuous evaluation and suggestions will be given to student in order to improve their performance.

E. Student Learning Outcomes / objectives:

- The Programme aims at providing students with the methodological concepts and tools needed to acquire top-level skills in the field of some selected instrumentation
- At the end students would gain experience in using these tools and analyzing the data.

F. Recommended Study Material:

❖ **Text books/Reference books**

1. Instrumental methods of analysis by Williard Merritt Dean Settle, 7th Ed. CBS publishers and distributors Pvt. Ltd.,
2. Instrumental methods of analysis by Williard Merritt Dean Settle, 7 th Ed. CBS publishers and distributors Pvt. Ltd.,
3. Principles of Gene Manipulation and Genomics by Sandy B. Primrose, Richard Twyman 7 th Ed. Wiley-Blackwell
4. Molecular Cloning: A Laboratory Manual by Joseph Sambrook, David William Russell 3 rd Ed.CSHL Press
5. Principles and Techniques of Biochemistry and Molecular Biology by Wilson and Walker 7 th Ed. Cambridge University Press
6. Principles of Instrumental Analysis by Douglas A. Skoog, F.James Holler and Timothy A.Nieman. Publisher: Saunders College Publishing.

RD702: INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the course:

The objective of the course is to introduce the students:

- To provide a general and broad introduction to the multi-disciplinary field of nanoscience and nanotechnology
- During the course the students will acquire the basic knowledge of why and how the physicochemical properties change at the nanoscale.
- The students will become familiar with the typical techniques that allow the observation, characterization and manipulation of matter at the atomic, molecular and supramolecular level.
- The recent scientific and technology work in the nano world will be presented to demonstrate the potential of nanoscience and nanotechnology in diverse areas such as medicine, biotechnology, chemical industry, information and communication technology, production and storage of energy, synthesis and manufacture of new materials, etc.
- It is also attempted that the student becomes aware of the ethical, social and economic implications that can lead this new discipline.
- To cultivate interest in the research and development of nanotechnology for future advancement of the career.

B. Outline of the Course:

Sr No.	Title of Unit	Minimum No. of Hrs
1.	Nanotechnology – development history & Implications of nanotechnology	6
2.	Overview on characterization and synthesis of nanostructure materials	10
3.	Overview of nanostructures & Nano devices	10
4.	New fields of nanotechnology	4

Total Hours (Theory): 30

C. Syllabus Topics:

1. Nanotechnology – development history & Implications of nanotechnology
   Concept of nanoscience and nanotechnology, Nanotechnology in the history and in nature. Impact of the nanotechnology in the society: Ethical, social, economic and environmental implications. the nanoscale. Size dependent physical and chemical properties. Surface effects. Importance of the surface at nanoscale. The surface/volume ratio. Size dependent properties
2. Overview on synthesis and characterization of nanostructure materials.
   Physical, chemical and biological methods of synthesis of nanostructures, Electron microscopy, scanning probe microscopy, non-imaging techniques
3. Overview of nanostructures & Nano devices
   zero dimensional, one dimensional and two dimensional nanostructures , Electronic devices, magnetic devices, photonic devices, mechanical devices, fluidics devices and biomedical devices
4. New fields of nanotechnology
   quantum computing, spintronics, nanomedicines, energy, etc.

D. Instructional Methods and Pedagogy:

The topics will be discussed in interactive class room sessions using classical black-board teaching to power-point presentations. Students will be exposed to practical operations, and lab visit and experimental demonstrations of some of the equipment facilities for Nano fabrication & characterization available in UNI. Students will produce a technical report on the experiences.

E. Student Learning Outcomes / objectives:

Nanotechnology promises to be the technology of the future benefitting the humanity in a number of ways. This course is aimed at preparing students for further industrial or academic work in the field of nano-characterization techniques.

F. Recommended Study Material:

❖ **Text Books / Reference Books:**

1. Essentials of nanotechnology by Jeremy Ramsden [JR], 2009, Jeremy Ramsden & Ventus Publishing ApS,
2. Introduction to Nanoscience, S.M.Lindsay, Oxford ISBN 978-019-954421-9 (2010).
3. Guozhong Cao (2004). *Nanostructures and Nanomaterials: Synthesis, Properties & Applications*, 448 pages, Imperial College Press, ISBN-10: 1860944159.
4. NANO: The Essentials Understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw-Hill Publishing Co. Ltd., 2007.
5. Nanoscience and Nanotechnology, B K Parthsarathy, ISHA Books, New Delhi, 2007.
6. Nanotechnology: Principles and practices, Sulabha K Kulkarni, Capital publishing company, 2007.

MB650: CREATIVE LEADERSHIP (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Course Objectives

The objectives of this course are:

- To create awareness about traits, types, approaches /theories and contemporary issues of leadership.
- To nurture qualities of creative leadership to meet the 21st century challenges in students.

B. Outline of the Course:

Module No.	Title/Topic	Classroom Contact Sessions
1	**Introduction to Leadership** • What are Leadership Skills? • Ways of Conceptualizing Leadership • Definition and Components • A Born Leader • Traits of Successful Leader • Why Leadership? o Managerial Roles • Importance of Leadership **Leading Vs Managing** • Roles and Relationships • Developing Personality for Effective Leading Roles • Authority Vs. Responsibility • Leading the Team • Leadership–Styles, Models and Philosophy	05
2	**Leadership Approach** • Trait Approach • Skills Approach • Style Approach • Situational Approach • Psychodynamic Approach **Leadership Theories** • Contingency Theory • Path-Goal Theory • Leader-Member Exchange Theory	05

Module No.	Title/Topic	Classroom Contact Sessions
3	**Leadership Processes** • Transactional Leadership • Transformational Leadership • Authentic Leadership • Team Leadership • Integrative Leadership • Liquid Leadership	**05**
4	**Women and Leadership** • Gender and Leadership Styles • Gender and Leadership Effectiveness • Glass Ceiling Turned Labyrinth • Strengths of Women Leadership • Criticism and Application	**05**
5	**Culture and Leadership** • Dimensions of Culture • Clusters of World Cultures • Leadership Behavior and Culture Clusters • Universally Desirable and Undesirable Leadership Attributes • Criticism and Application • Leadership for High Performing Organisations • General Principles for Creative Culture • Nurturing Personal Creativity	**05**
6	**Contemporary Issues in Leadership** • Power and Politics in Leadership • Ethics in Leadership • Cases in Leadership	**05**
	Total	**30**

C. **Pedagogy**

The course will emphasise self-learning and active classroom interaction based on students' prior preparation. The course instructor is expected to prepare a detailed session-wise schedule, showing the topics to be covered, the reading material and case material for every session. Wherever the material for any session is drawn from sources beyond the prescribed text-book, reference books, journals and magazines in the library, or from websites and other resources not accessible to the students, the course instructor should make the material available to the students well in advance, so that the students can come prepared for the classes. The pedagogical mix will be as follows:

- Classroom Contact Sessions ... About 20 Sessions
- Case Discussions ... About 03 Sessions
- Presentation ... About 03 Sessions
- Management Exercise/ Stimulations/Game ... About 02 Sessions
- Feedback ... About 02 Sessions

The exact division among the above components will be announced by the instructor at the beginning of the semester as a part of detailed session-wise schedule.

D. Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks	Percentage of total internal evaluation
1	Quizzes	3	10	30	10
2	Case Analysis and Presentation	2	45	90	30
3	Assignment / Project work	1	60	60	20
4	Internal Tests	2	45	90	30
5	Attendance and Class Participation			30	10
			Total	**300**	**100**

The total marks will be divided by 10 and declared as Institute-level evaluation marks for the course. The Institute-level evaluation will constitute 30% of the total marks for the course.

E. External Evaluation

The University examination will be based on oral presentation, review of students' reports and a viva-voce and will carry 70% marks for the course evaluation.

F. Learning Outcomes

At the end of the course, the student should have developed:

- Appreciation for types, traits, approaches and leadership models/theories.
- Motivation for leadership roles and responsibilities.
- Qualities of creative leadership skills.

G. Reference Material

❖ **Text-book:**

1. Leadership – Theory and Practices , Peter G. Northouse, Sage Publications India Pvt. Ltd., Latest Edition

❖ **Reference Books:**

1. Liquid Leadership by Brad Szollose, Prolibris Publishing Media, Latest Edition
2. Effective Leadership by Lussier/ Achua , Cengage Learning Publications, Latest Edition
3. Integrative Leadership by Hatala & Hatala, Pearson Power Publication, Latest Edition
4. Cases in Leadership by Rowe and Guerrero, Sage Publications India Pvt. Ltd., Latest Edition

❖ **Journals / Magazines / Newspapers:**

1. HBR Issues on Building Leadership Skills

2. International Journal of Innovation, Creativity and Change
3. Economic Times
4. Business Standard

PH825: COMMUNITY PHARMACY OWNERSHIP (UE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course

Community pharmacy is concerned with promoting the safe and appropriate use of drugs and common medical devices.
Ownership concept in Community Pharmacy is required to create for the effective delivery of pharmacy services in an regulated environment in which the nature of pharmacy is clearly evolving from the supply of goods (pharmaceuticals under prescription, pharmacist and pharmacy only medicines, and other goods) to the supply of services designed to support the optimal use of medication as part of a wider health care strategy.

B. Outline of course:

Sr. No.	Title of Unit	No. of Contact Hours
1	Introduction to Community pharmacy	10
2	Community Pharmacy Management	10
3	Pharmacy Business Plan	10
	Total	30

C. Detailed Syllabus:

Sr no	Title of Unit	Topics
1	Introduction to Community pharmacy	Roles & Responsibility, relationship with other health care providers, Prescribed medication order interpretation including OTC medicines, Safe use of medical devices.
2	Community Pharmacy Management	Role, process and scope of Community Pharmacy Management, modern technologies, financial, material, staff management and Drug store management, Code of ethics for Pharmacy.
3	Pharmacy Business Plan	Creating a Successful Pharmacy Business Plan, Business Owner Roles, Responsibilities, and Management Styles, Legal, Financial and Accounting Advice for the Beginning Owner, Marketing of Pharmacy Practice.

D. Instructional Methods and Pedagogy:

The content of the syllabus would be transmitted through different pedagogy tools like interactive class room sessions using classical chalk - board teaching to Power point presentations. Class room teaching would also be supplemented with group discussions, seminars, assignments and case studies.

E. Student Learning Outcomes / Objectives

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

- The concept of Community Pharmacy Ownership and its scope
- Students understand the role of the pharmacist in community and development
- Able to learn skill require to set Pharmacy store & its management

F. Recommended Study Material

❖ **Text / Reference Books:**

1. Mohd. Aquil, Practice of Hospital, clinical & Community Pharmacy Elsevier
2. Paul Rutter, Community Pharmacy E-Book, Symptoms, Diagnosis and Treatment, 3rd Edition
3. A Textbook of Clinical Pharmacy Practice: G. Parthasarathi, Karin Nyfort-Hansen and Milap Nahata, Universities Press.
4. Research articles as per the assignment

M. Tech. (Information Technology) Programme

SYLLABI

(Semester – 2)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT744: INFORMATION AND NETWORK SECURITY

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	4	7	5
Marks	100	100	200	

A. Objective of the Course:

The main objectives for offering the course Cryptography and Network Security are:

- To introduce cryptography theories, algorithms and systems. Necessary approaches and techniques to build protection mechanisms in order to secure computer networks
- To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hash and digital signature.
- To explore issues surrounding secure key management, random number generation, and the incorporation of cryptography into legacy applications.
- To analyze performance of various cryptographic and cryptanalytic algorithms.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction and Mathematical Foundations	07
2.	Symmetric Key Ciphers	11
3.	Public Key Cryptography	07
4.	Message Authentication and HashFunction	07
5.	Network Security	09
6.	System Security	04

Total hours (Theory): 45

Total hours (Lab): 60

Total hours: 105

C. Detailed Syllabus:

1.	**Introduction and Mathematical Foundations**	**07 hours**	**15 %**
1.1	Security trends – Attacks, Services and Mechanism		
1.2	Conventional Encryption Model, Classical Encryption Techniques, Different types of ciphers, Steganography		
1.3	Basic Number theory—Prime And Relative Prime Numbers, Modular Arithmetic, Congruence ,Fermat and Euler's theorem, Euclid's Algorithm, Chinese Remainder theorem, LFSR sequences , Finite fields.		
2.	**Symmetric Key Ciphers**	**11 hours**	**25 %**
2.1	Simplified Data Encryption Standard, DES, Triple DES		
2.2	Block Cipher Principles,Characteristics Of Advanced Symmetric Block Cipher, Differential And Linear cryptanalysis, Block Cipher Design Principles		
2.3	Advanced Encryption Standard Algorithm,RC4 and RC5		
2.4	Modes of Operation		
2.5	Pseudorandom Number generator and function, Key Distribution		
3.	**Public Key Cryptography**	**07 hours**	**15%**
3.1	Principles Of Public-Key Cryptography		
3.2	RSA Algorithm		
3.3	Key Management		
3.4	ElGamal Algorithm		
3.5	Diffie-Hellman Key Exchange		
4.	**Message Authentication and Hash Function**	**07 hours**	**15 %**
4.1	Authentication Requirement		
4.2	Hash Functions ,Message Authentication Code, Security Of Hash Functions And MAC		
4.3	MD5 Message Digest Algorithm, Secure Hash Algorithm , HMAC		
4.4	Authentication protocols ,Digital Signatures, DSS,		
5.	**Network Security**	**09 hours**	**20%**
5.1	Authentication Applications—Kerberos, X.509 Directory		

Authentication Service,

5.2 Electronic Mail Security—PGP ,S/MIME

5.3 IP security —Overview, ESP, AH, Transport and Tunnel mode in IP Sec

5.4 Web Security— Web Security Requirement, SSL, TLS,SET

6. System Security **04 hours** **10%**

6.1 Intruders, Viruses and Related Threats

6.2 Firewall Design Principles

6.3 Trusted Systems

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

- Know the importance of security and to apply the concepts of techniques and methods to implement security mechanism.
- Implements the aspects of integrity and authentication, like digital signature and message digest, and map them with practical use of it.

- Come up with new techniques and methods which can be considered as algorithm of cryptography and eventually can be deployed as independent technique.
- Apply the technique to make legacy system more secure by adapting latest methods.

F. Recommended Study Material:

Text Books:

1. William Stallings, Cryptography And Network Principles And Practice,Prentice Hall, Pearson Education Asia

Reference Books:

1. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Companies
2. AtulKahate, Cryptography & Network Security, The McGraw-Hill Companies
3. William Stallings Network Security Essentials: Applications And Standards, Prentice Hall, Pearson Education

Reference Links/ e-content:

1. http://people.csail.mit.edu/rivest/crypto-security.html
2. http://www.cryptix.org/
3. http://www.cryptocd.org/
4. http://www.cryptopp.com/
5. https://sites.google.com/a/charusat.ac.in/pnp/

IT745: DATA SCIENCE & MODELING

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives to give the course Data Analytics & Modeling are:

- To understand the basics of Data Science & Modeling.
- To develop in depth understanding of the key technologies in data science and business analytics: data mining, visualization techniques and predictive modeling.
- To apply principles of Data Science to the analysis of business problems.
- To use data mining software to solve real-world problems.
- To apply algorithms to build machine intelligence.

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction	06
2.	Data Exploration and Preprocessing	09
3.	Modeling Technique I: Frequent Pattern Mining	06
4.	Modeling Technique II: Classification and Regression	09
5.	Modeling Technique III : Cluster Analysis	06
6.	Mining Complex Types ofData	09

Total hours (Theory): 45 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 75 Hrs.

C. Detailed Syllabus:

1. Introduction **06 hours** **13.33%**

Introduction to Data Science, What is a Data Scientist, Data Science Applications inReal-World Scenarios, Data Science History, Modern Trends, Motivation for Data Mining, Data Mining-Definition and Functionalities

2. Data Exploration and Preprocessing **09 hours** **20.00%**

Data Objects and Attribute Types,Basic Statistical Descriptions of Data,Data Visualization, Data Preprocessing Techniques

3. Modeling Technique I: Frequent Pattern Mining **06 hours** **13.33%**

Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

3. Modeling Technique II: Classification and Regression **09 hours** **20.00%**

Basic Concepts of Classification and Regression – Issues regarding Classification, Classification Methods : Decision Tree, Bayesian Classification, K-Nearest Neighbors Classification, Linear and Nonlinear regression, Logistic Regression.

4. Modeling Technique III :Cluster Analysis **06 hours** **13.33%**

Types of Data in Cluster Analysis, Partitioning Methods - Hierarchical Methods - Density-Based Methods- Model-Based Clustering Methods- Clustering High-Dimensional Data, Outlier Analysis.

5. Mining Complex Types of Data **09 hours** **20.00%**

Mining Unstructured Data, Mining Data Streams, Link Analysis, Model for Recommendation System, Dimensionality Reduction.

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

By taking this course students will be able to,

- Integrate components of data mining to produce knowledge-based solutions for real-world challenges

- Generate hypothesis and determine ways to conduct an analysis based on the interactivity and integration of data systems
- Students will be able to formulate visualization and discovery strategies
- Apply analytical techniques to prepare data for analysis

F. Recommended Study Material:

❖ **Text Books:**

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann

❖ **Reference Books:**

1. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
2. Jure Leskovec,"Mining of Massive Datasets", Cambridge University Press.
3. Lillian Pierson, "Data Science for Dummies", Wiley Publisher.

IT746: COMPUTATIONAL INTELLIGENCE

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Computational Intelligence are:

- The objective of this course is to introduce the basic tools and techniques in Computational Intelligence such as Neural Networks and Genetic Algorithms from an application and research perspective to the students.
- The major focus of this course will be on the use of Computational Intelligence for classification and Pattern Matching Applications.
- Introducing concepts, models, algorithms, and tools for development of intelligent systems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Fundamentals of computation techniques.	05
2.	Fundamentals of neural networks.	08
3.	Advanced neural network architectures	06
4.	Fuzzy Systems	07
5.	Design and analysis of Genetic Algorithms.	06
6.	Design and analysis of Particle Swarm Optimization.	07
7.	Applications of Computational Intelligence	06

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	**Fundamentals of evolutionary computation techniques.**	**05**	**11%**
	1.1 What is IS,CI,SC? Its application		
	1.2 Characteristics, advantages and disadvantages		
2.	**Fundamentals of neural networks.**	**08**	**17 %**
	2.1 Learning in NN		
	2.2 The Perceptron Convergence Theorem		
	2.3 Multi-Layer Perceptron		
	2.4 Training, Testing, and Validation		
3.	**Advanced neural network architectures**	**06**	**13 %**
	3.1 Radial Basis Function Network		
	3.2 Unsupervised Learning: k-Means		
	3.3 Unsupervised Learning: LVQ		
	3.4 Unsupervised Learning: SOM		
	3.5 Support Vector Machines(SVM)		
4.	**Fuzzy Systems**	**07**	**17 %**
	4.1 Introduction of Fuzzy Logic		
	4.2 MF Formulation and Parameterization Extension Principal and Fuzzy Relations		
	4.3 Fuzzy Rules-Fuzzy Reasoning		
	4.4 Mandani Fuzzy Model - Sugeno Fuzzy Model - Tsukamoto Fuzzy Model		
	4.5 Reinforcement learning with fuzzy		
5.	**Design and analysis of Genetic Algorithms.**	**06**	**12%**
	5.1 Genetic Algorithms, The Fundamental Theorem of Genetic Algorithms		
	5.2 Dimensionality Reduction & Feature Selection		
6.	**Design and analysis of ACO and PSO.**	**07**	**17%**
	6.1 Ant Colony Optimization & Particle Swarm Optimization		
7.	**Applications of computational Intelligence**	**06**	**13%**
	7.1 Various applications of Computational Intelligence in different fields		

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

- To solve difficult and complex problem of computer science using CI techniques.
- To select any R&D field related to application of CI in PHD courses.
- To develop software solution as per need of today's IT edge which requires high automation and less human intervention.

F. Recommended Study Material:

Text Books:

1. Computational Intelligence - Concepts to Implementations by Eberhart & Shi
2. A. P. Engelbrecht, Computational Intelligence: An Introduction, John Wiley & Sons, 2007.
3. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009
4. James Kennedy, Russell Eberhart and Yuhui Shi - Swarm Intelligence

Reference Books:

1. L. N. de Castro, "Fundamentals of Natural Computing: An Overview", Physics of Life Reviews, Vol. 4, No. 1, pp. 1-36, 2007
2. H.-G. Beyer and H.-P. Schwefel. Evolution Strategies: A Comprehensive Introduction. Journal Natural Computing, Vol. 1, No. 1, pp. 3–52, 2002.
3. Melanie Mitchell - An Introduction To Genetic Algorithms

Web Materials:

1. https://www.youtube.com/watch?v=fgtUFzxNztA
2. http://nptel.iitm.ac.in/video.php?courseId=1041
3. http://www-formal.stanford.edu/jmc/whatisai/whatisai.html
4. http://www.webopedia.com/TERM/A/artificial_intelligence.html
5. http://en.wikipedia.org/wiki/Artificial_intelligence

IT764: WEB SERVICES & SERVICE ORIENTED COMPUTING (PE-II)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The course is focused on service implementation and deployment based on Service-Oriented Architecture principles. Fundamental concepts of Service Oriented Architecture (SOA), including related computer science, engineering and business aspects. Design, modeling and simulation of SOA software systems.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Overview of SOA	03
2.	SOA Fundamentals	06
3.	SOA Planning and Analysis	06
4.	SOA Design and implementation	06
5.	Managing SOA Environment	08
6.	SOA and WS	08
7.	Implementation of SOA and WS	08

Total hours (Theory): 45Hrs.

Total hours (Lab): 30Hrs.

Total hours: 75Hrs.

C. Detailed Syllabus:

1.	**OVERVIEW OF SOA**	**03 hours**	**07 %**

Concepts; Service governance, characteristics; Business and technical benefits

2.	**SOA FUNDAMENTALS**	**06 hours**	**13 %**

Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment

3.	**SOA PLANNING AND ANALYSIS**	**06 hours**	**13 %**

Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA).

4.	**SOA DESIGN AND IMPLEMENTATION**	**06 hours**	**13 %**

Service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance.

5.	**MANAGING SOA ENVIRONMENT**	**08 hours**	**18 %**

Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and metrices), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle.

6.	**SOA AND WS**	**08 hours**	**18 %**

The WS platform (XML, SOAP, WSDL, UDDI); Service contracts; Service-level data model, security and interaction patterns; Business process management; Maturity models

7. IMPLEMENTATION OF SOA AND WS **08 hours** **18 %**

Frameworks; Building contract-first web services based on framework; Building code-first web services

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

Upon successful completion of this course,

- Students will be able to decide on implementation of service that satisfies SOA principles.
- To prepare and construct web service according to output of SOA design phase.

F. Recommended Study Material:

❖ **Text Books:**

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Prentice Hall Publication, 2005

❖ **Reference Books:**

1. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah, "Service-Oriented Architecture Compass: Business Value, Planning, and Enterprise Roadmap", IBM Press Publication, 2005.
2. Sandy Carter, "The New Language of Business: SOA & Web 2.0", IBM Press, 2007.
3. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall Publication, 2004
4. Dave Chappell, "Enterprise Service Bus",O'Reilly Publications, 2004
5. SanjivaWeerawarana, Francisco Curbera, Frank Leymann, Tony Storey, Donald F.Ferguson, "Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WS-Addressing, WS-BPEL, WS-Reliable Messaging, and More", Prentice Hall Publication, 2005
7. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Addison Wesley Publication, 2004

8. ERL, T.; Service-oriented architecture : a field guide to integrating XML and Web services, Prentice Hall PTR, 2004, ISBN- 0131428985
9. GRAHAM, S.; Building Web services with Java : making sense of XML, SOAP, WSDL and UDDI; Sams, 2001, ISBN: 0672321815.

IT765: INTERNET OF THINGS (PE-II)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Internet of Things (IoT) are:

- Have built a couple of applications that will communicate with IoT hardware and software
- Have researched a specific IoT domain and provided insight on current work
- Be able to explain how IoT, cloud computing and big data analytics can work together
- Be able to evaluate an IoT offering in terms of IoT levels and Protocols

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction of IoT	06
2.	IoT in depth	10
3.	Scalable and Trust based Framework	12
4.	Research and Innovation in IoT	11
5.	IoT Tools and Data Analytcis	06

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction of IoT**	**06 hours**	**10 %**
1.1	Introduction		
1.2	Domains of IoT		
1.3	M2M Vs. IoT		
1.4	European Standards, ISO/IEC JTC 1/WTC 7 Sensor Networks, ETSI, IEEE, IETF, ITU-T		
1.5	Internet of Things today and tomorrow		
2.	**IoT in dept**	**10 hours**	**25 %**
2.1	Internet of Things: layers, languages, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia.		
3.	**Scalable and Trust based Framework**	**12 hours**	**30 %**
3.1	Main Concepts and Motivations for the framework		
3.2	Identity Management		
3.3	Context Awareness		
3.4	Policy based framework for Security and Privacy in IoT		
4.	**Research and Innovation in IoT**	**11 hours**	**20 %**
4.1	IoT Vision and common Definitions		
4.2	IoT Research and Innovation Directions		
4.3	IoT Applications and Use Case Scenarios, IoT Application Areas		
4.4	IoT Smart-X applications including Smart Cities, Smart Mobility, Smart Transport etc.		
4.5	IoT and Future related technologies: Cloud Computing, Semantic Technologies		
4.6	Network and Communication: Networking Technology, Growth of Wireless Networks, Mobile Networks, Iot and IPV6 etc.		
5.	**IoT Tools and Data Analytics**	**06 hours**	**15 %**
5.1	Tools in IoT, Data Analytics in IoT, IoT Physical Systems		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

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

- Understand the basic concepts Internet of Things
- Integration of Existing technology for development of IoT Applications
- Student will be able to make program which works on Sensors

F. Recommended Study Material:

❖ **Text Books:**

1 "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", Ovidiu Vermesan, Peter Friess, River Publishers.

❖ **Reference Materials:**

1. Internet of Things: A hands on approach by Arhdeep Bahga and Vijay Madisetti.
2. Research papers from IEEE, Springer etc.

❖ **Web Materials:**

1. http://www.vs.inf.ethz.ch/res/show.html?what=iot – For Research Papers
2. www.ieee.org – For standards and technical research papers

IT766: CLOUD COMPUTING (PE-II)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

- Identify key elements of the cloud computing
- Understand and appreciate the need for cloud computing, and identify their use in industrial applications
- Apply the knowledge of the cloud application development platform for the development of e-business systems such as e-government, e-banking, e-logistics, e-learning and e-health.
- To analyse the current issues in cloud computing

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Fundamental of Virtualization	02
2	Fundamental Concepts and Models	02
3	Cloud-Enabling Technology	04
4	Fundamental Cloud Architectures	08
5	Advanced Cloud Architectures	12
6	Specialized Cloud Architectures	13
7	Build Cloud Application using Cloudstack	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1 Fundamental of Virtualization **02 Hours 05%**

Type of Virtualization, Virtualization Technologies, Virtualize your Environment, Managing Virtualization Environment, Storage

Virtualization.

2.	**Fundamental Concepts and Models** Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models	**02 Hours**	**05%**
3.	**Cloud-Enabling Technology** Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.	**04 Hours**	**9%**
4.	**Fundamental Cloud Architectures** Workload Distribution Architecture, Resource Pooling Architecture ,Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture	**08 Hours**	**17%**
5.	**Advanced Cloud Architectures** Hypervisor Clustering Architecture ,Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture ,Cloud Balancing Architecture ,Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture	**12 Hours**	**26%**
6.	**Specialized Cloud Architectures** Direct I/O Access Architecture, Direct LUN Access Architecture, Dynamic Data Normalization Architecture, Elastic Network Capacity Architecture, Cross-Storage Device Vertical Tiering Architecture, Intra-Storage Device Vertical Data Tiering Architecture , Load Balanced Virtual Switches Architecture, Multipath Resource Access Architecture, Persistent Virtual Network Configuration Architecture, Redundant Physical Connection for Virtual Servers Architecture, Storage Maintenance Window Architecture	**13 Hours**	**28%**
7.	**Build Cloud Application using Cloudstack.** Apache CloudStack Architecture, Apache CloudStack Configuration.	**04 Hours**	**10%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Faculty would use coached problem solving method as it is class format in which faculty provide a structured, guided context for students working collaboratively to solve problems.
- Attendance is compulsory in lectures and laboratory which carries 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weight age of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcomes:

By taking this course Cloud Computing

- be able to evaluate a set of business requirements to determine suitability for a cloud computing delivery model.
- be able to identify and design an ICT Risk Management strategy for a cloud computing delivery plan to meet business requirements.
- be able to critically analyze business requirements to plan a migration to a cloud model.
- be able to compare and critique Service Level Agreements (SLA) that meet the business requirements for a cloud computing plan.

F. Recommended Study Material:

❖ **Text Books:**

1. Thomas Erl, Zaigham Mahmood,and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", Prentice Hall
2. Navin Sabharwal, Ravi Shankar "Apache CloudStack Cloud Computing" PACKT Publishing

❖ **Reference Books:**

1. Ravi Shankar, Navin Sabharwa "Cloud Computing First Steps: Cloud Computingfor Beginners" CreateSpace Independent Publishing Platform
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski "Cloud Computing: Principles and Paradigms" Wiley
3. Judith Hurwitz, Robin Bloor "Cloud Computing For Dummies" , for Dummies

IT768: APPLIED CRYPTOGRAPHY (CT- II)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Cryptography and Network Security are:

- To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hashes, and digital signature.
- To explore issues surrounding secure key management, random number generation, and the incorporation of cryptography into legacy applications.
- To analyze performance of various cryptographic and cryptanalytic algorithms.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Classical Cryptography	04
2.	Shannon's Theory	03
3.	Block Ciphers And The Advanced Encryption Standard	05
4.	Cryptographic Hash Functions	05
5.	The RSA Cryptosystem And Factoring Integers	05
6.	Public-Key Cryptography And Discrete Logarithms	05
7.	Signature Schemes	05
8.	Pseudo-Random Number Generation	03
9.	Key Distribution & Key Agreement Schemes	05
10.	Public-Key Infrastructure & Multicast Security	05

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Classical Cryptography**	**04 hours**	**09 %**
1.1	Introduction: Some Simple Cryptosystems		
1.2	Cryptanalysis		
2.	**Shannon's Theory**	**03 hours**	**07 %**
2.1	Introduction		
2.2	Elementary Probability Theory		
2.3	Perfect Secrecy		
2.4	Entropy		
2.5	Product Cryptosystems		
3.	**Block Ciphers And The Advanced Encryption Standard**	**05 hours**	**11%**
3.1	Introduction		
3.2	Substitution-Permutation Networks		
3.3	The Data Encryption Standard		
3.4	The Advanced Encryption Standard		
3.5	Modes of Operation		
4.	**Cryptographic Hash Functions**	**05 hours**	**11%**
4.1	Hash Functions and Data Integrity		
4.2	Security of Hash Functions		
4.3	Iterated Hash Functions		
4.4	Message Authentication Codes		
5.	**The RSA Cryptosystem And Factoring Integers**	**05 hours**	**11%**
5.1	Introduction to Public-key Cryptography		
5.2	The RSA Cryptosystem		
5.3	Primality Testing		
5.4	Factoring Algorithms		
5.5	Other Attacks on RSA		
6.	**Public-Key Cryptography And Discrete Logarithms**	**05 hours**	**11%**
6.1	The ElGamal Cryptosystem		
6.2	Algorithms for the Discrete Logarithm Problem		
6.3	Lower Bounds on the Complexity of Generic Algorithms		

6.4	Finite Fields		
6.5	Elliptic Curves		
7.	**Signature Schemes**	**05 hours**	**11%**
7.1	Introduction		
7.2	Security Requirements for Signature Schemes		
7.3	The ElGamal Signature Scheme		
7.4	Variants of the ElGamal Signature Scheme		
8.	**Pseudo-Random Number Generation**	**03 hours**	**07%**
8.1	Introduction and Examples		
8.2	The Blum-Blum-Shub Generator		
8.3	Probabilistic Encryption		
9.	**Key Distribution&Key Agreement Schemes**	**05 hours**	**11%**
9.1	Introduction		
9.2	Diffie-Hellman Key Predistribution		
9.3	Key Distribution Patterns		
9.4	Session Key Distribution Schemes		
9.5	Diffie-Hellman Key Agreement		
9.6	Key Agreement Using Self-Certifying Keys		
9.7	Encrypted Key Exchange		
10.	**Public-Key Infrastructure&Multicast Security**	**05 hours**	**11%**
10.1	Introduction: What is a PKI?		
10.2	Certificates		
10.3	The Future of PKI?		
10.4	Identity-Based Cryptography		
10.5	Introduction to Multicast Security		
10.6	Broadcast Encryption		
10.7	Multicast Re-Keying		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.

- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

- Know the importance of security and to apply the concepts of techniques and methods to implement security mechanism.
- Implements the aspects of integrity and authentication, like digital signature and message digest, and map them with practical use of it.
- Come up with new techniques and methods which can be considered as algorithm of cryptography and eventually can be deployed as independent technique.
- Apply the technique to make legacy system more secure by adapting latest methods.

F. Recommended Study Material:

❖ **Text Books:**

4. Douglas R. Stinson, Cryptography: Theory and Practice, Chapman & Hall/CRC,

❖ **Reference Books:**

1. William Stallings, Cryptography And Network Principles And Practice,Prentice Hall, Pearson Education Asia
2. AtulKahate, Cryptography & Network Security, The McGraw-Hill Companies
3. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Companies

❖ **Reference Links/ e-content:**

6. http://people.csail.mit.edu/rivest/crypto-security.html
7. http://www.cryptix.org/
8. http://www.cryptocd.org/
   http://www.cryptopp.com/

EC768: DIGITAL IMAGE & SPEECH PROCESSING(CT-II)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The goal of this course is to provide the student with a working knowledge of Identify the quality characteristics of medical images that can be changed by digital processing, Describe the general relationship between image contrast and pixel values & Describe how the process of blurred (un-sharp) mask subtraction can increase the visibility of detail in images. Prerequisite knowledge for this subject is audio & video engineering .

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Digital Image Processing: Introduction	1
2.	Digital Image Fundamentals	3
3.	Image Enhancement in Spatial Domain	5
4.	Image Enhancement in Frequency Domain	4
5.	Image Restoration	5
6.	Color Image Processing	4
7.	Digital Speech Signal Processing: Introduction	3
8.	Digital Models for Speech Signal	5
9.	Time Domain Models for Speech Processing	5
10.	Digital Representation of The Speech Waveforms	4
11.	Short Time Fourier Analysis	3
12.	Linear Predictive Coding of Speech	3

Total Hours (Theory):45

Total Hours (Lab): 30

Total Hours:75

C. Detailed Syllabus:

This will provide details about topics under each units of the course.

1.	**Digital Image Processing: Introduction**	01 Hours	2 %
1.1	Fundamental steps in Digital Image Processing		
1.2	Components of Image Processing System.		
2.	**Digital Image Fundamentals**	03 Hours	6 %
2.1	Image sensing and Acquisition		
2.2	Image Sampling and Quantization		
2.3	Basic relationship between pixel, Linear and Non Linear operation		
3.	**Image Enhancement in Spatial Domain**	05 Hours	11%
3.1	Basic Gray Level Transformations, Hostogram Processing		
3.2	Enhancement using Arithmatic /Logic operations		
3.3	Basics of Spatial filtering, Smoothing Spatial Filters		
3.4	Sharpening Spatial Filters		
4.	**Image Enhancement in Frequency Domain**	04 Hours	10%
4.1	Introduction Fourier Transform and Frequency Domain		
4.2	Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters		
4.3	Homomorphic Filtering		
5.	**Image Restoration**	05 Hours	11 %
5.1	Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering		
5.2	Periodic Noise Reduction by Frequency Domain Filtering		
5.3	Linear, Position-Invariant Degradations , Estimating the Degradation Function		
5.4	Inverse Filtering ,Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering,		
5.5	Geometric Mean Filter, Geometric Transformations		
6.	**Color Image Processing**	04 Hours	10 %
6.1	Color Models, Pseudo Color Processing		
6.2	Basics of Full-Color Image Processing, Color Transformations		
7.	**Digital Speech Signal Processing: Introduction**	03 Hours	06 %
7.1	Speech Signal, Signal Processing		

7.2	Digital Speech Processing		
7.3	Transform Representation of Signals and Systems		
7.4	Fundamentals of Digital Filters, Sampling		
8	**Digital Models for Speech Signal**	05 Hours	11 %
8.1	Process of Speech Production		
8.2	Acoustic Theory of Speech Production		
8.3	Digital Model for Speech Signals		
9	**Time Domain Models for Speech Processing**	05 Hours	11 %
9.1	Short Time Energy and Average Magnitude, Short Time Ave. Zero Crossing Rate		
9.2	Pitch Period Estimation using Parallel processing Approach, Short Time Autocorrelation Function		
9.3	Pitch Period Estimation using Autocorrelation Function, Median Smoothing and Speech Processing		
10	**Digital Representation of The Speech Waveforms**	04 Hours	10 %
10.1	Sampling Speech Signals, Statistical Model for Speech		
10.2	Instantaneous Quantization, Adaptive Quantization		
10.3	Differential Quantization, delta Modulation, DPCM, comparison of Systems		
10.4	Direct Digital Code Conversion		
11	**Short Time Fourier Analysis**	03 Hours	06 %
11.1	Definitions and Properties		
11.2	Design of Digital Filter Bank		
11.3	Spectrographic Displays		
11.4	Pitch Detection, Analysis-by-Synthesis		
12	**Linear Predictive Coding of Speech**	03 Hour	06 %
12.1	Basic Principles of Linear Predictive Analysis,		
12.2	Solution to LPC equations, Comparisons between methods of solutions		
12.3	Prediction Error Signal, Applications of LPC Parameters		

D Instructional Methods and Pedagogy:

- Multimedia Projector
- OHP
- Audio Visual Presentations
- Chalk + Board

- White Board
- Online Demo
- Charts

E Student Learning Outcomes / objectives:

- Enhance the images for various medical & satellite applications
- Able to restore the images for forensic purpose
- To perform pseudo color image processing
- Implement digital model of speech signal
- predict the error of speech signal & learn LPC coder

F Recommended Study Material:

Reference books:

1. Digital Image Processing, Rafael Gonzalez, Richard Woods,2nd ed., Pearson Education
2. Digital Processing of Speech Signals, L.R. Rabiner, R.W. Schafer, Pearson Education
3. Fundamentals of Digital Image Processing, A.K. Jain ,Prentice Hall of India

Websites:

- www.qi.tnw.tudelft.nl/Courses/FIP/noframes/fip.html
- www.cs.dartmouth.edu/farid/tutorials/fip.pdf
- www.imageprocessingplace.com/root_files…/tutorials.htm
- speech.tifr.res.in/tutorials/fundamentalOfASR_picone96.pdf
  en.wikipedia.org/wiki/Speech_recognition

CE768: SOFTWARE PROJECT MANAGEMENT & QUALITY ASSURANCE (CT-II)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The course aims to provide and understanding management issues process during software project management. It provides holistic views of different aspect of development process necessary for the management of the project which includes various activities, resources, quality, cost and system configuration etc. Software Quality and its management has become an extremely important aspect of software development and maintenance. Various models have been proposed about quality assurance of software products and processes. This course will enable the student to understand the issues related to design and development of good quality software, data gathering, and interpretation and learn the relevant techniques and quality models. Students will study the various topics relevant to Software Quality and Testing. This course also provides Quality Assurance details. It focuses on types of testing and test case generation for testing the software. It introduces the testing tool to test the system. Student will also learn defect prevention and software maintenance.

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction to Software Project Management System	06
2.	Project Tracking and Configuration Management	08
3.	Introduction to Software Quality Assurance	05
4.	Software quality Assurance (SQA) Management and Software Quality Metrics	08
5.	Software Quality Engineering and Inspection and Defect prevention	06
6.	Software Testing and Maintenance	08
7.	Software Testing Tools	04

Total hours (Theory): 45Hrs.

Total hours (Lab): 30Hrs.

Total hours: 75Hrs.

C. Detailed Syllabus:

1. **Introduction to Software Project Management System** **06 Hours** **13 %**

   Overview of Project Planning, Project Estimation, Project Scheduling, Organization and Team Structure, Risk Analysis and Management, Resource Allocation

2. **Project Tracking and Configuration Management** **08 Hours** **17 %**

   Measurement of Physical and Financial progress, Earned value analysis, Status reports and Milestone reports, SCM activities, Standards for Configuration Audit Functions, Personnel in SCM Activities, Change control, Source code Control System (SCCS), Software Configuration Management: Some Pitfalls

3. **Introduction to Software Quality Assurance** **05Hours** **11 %**

   Quality Control, Assurance, Movements, SQA-Software Quality Assurance Activities, Approaches To SQA, Reliability, ISO 9000 And 9001, CMM Levels, Quality Audit, Concepts of Quality Improvement, Concepts of Process Maturity, Improving Process Maturity, IDEAL^{SM} Model for Process Improvement

4. **Software quality Assurance (SQA) Management and Software Quality Metrics** **08 Hours** **17 %**

   Overview of SQA planning, techniques and contents of a SQA plan , establishing quality goals - Quality Function Deployment- Goal/Question/Measure Paradigm, total quality Management, cost of quality, quality assurance management, quality standards, factors affecting SQA effort, Management review process - technical review process -software assertion process - walkthrough process - audit process - verification & validation, Measuring quality, measurement criteria, product and process quality metrics, metrics for configuration management and software maintenance, example of metrics programs, complexity metrics and their relationship with testing and quality, metrics for object-oriented software analysis.

5. **Software Quality Engineering, Inspection and Defect prevention** **06Hours** **13 %**

Defining Quality Requirements, Complexity Metrics and models, Project Tracking and Oversight, Data Quality Control, Software Inspection, Reliability Models, Reliability Growth Models

6. **Software Testing and Maintenance** **08Hours** **17 %**

Foundations of Testing, Test Planning, Test Design and Implementation, Testing Network Management Systems, Web Based Testing, Testing Object-Oriented systems, Test Execution and Measurement, Management Issues for Software Quality, Software Testing Types: Unit, Integration, & System, Benchmarking and Certification, Control flow & loop testing, Data-flow testing, Transaction-flow testing, Domain testing, Coverage vs. usage based testing, Software Reuse, Software Aging, Product Enhancement, Reverse Engineering, Re-engineering Method, Architectural Simplification

7. **Software** Testing Tools **04Hours** **12 %**

Test case Generation Methodology, Study of various Testing Tools (Win Runner, Load Runner), Automatic Testing Tool.

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

Upon successful completion of this course, students will be able to understand software project management process and different aspect of development process necessary for the management of the project which includes various activities, resources, quality, cost and system configuration etc. Student will learn the issues related to design and development of good quality software, data gathering, and interpretation and learn the relevant techniques and quality models. Students will study the various topics relevant to Software Quality and Testing. It focuses on types of testing and test case generation for testing the software. It introduces the testing

tool to test the system. Student will also learn defect prevention and software maintenance.

F. Recommended Study Material:

- **Text Books:**

1. Pankaj Jalote, "Software Project Management in Practice", 2002, Pearson, Education Asia.
2. Roger S. Pressman, "Software Engineering: A practical Approach", Fifth Editoin 2001, McGraw-Hill.
3. Bob Hughes and Mike Cotterell, "Software Project Management", Third Edition 2002, McGraw-Hill.

- **Reference Books:**

1. Rapid Testing" by Robert Culbertson, Chris Brown and Gary Cobb; Prentice-Hall, 2002.ISBN 0-13-091294-8
2. Metrics and Models in Software Quality by Stephen Kan, Addison-Wesley.
3. Software Engineering By Ian Sommerville Addison Wesley
4. Fundamentals of Software Engineering By Rajib Mall, Prentice Hall of India
5. The Capability Maturity Model: Guidelines for Improving the Software Process by Mark Paulik, Addison-Wesley.
6. "Black-Box Testing: Techniques for Functional Testing of Software and Systems", by Boris Beizer, John Wiley & Sons, Inc., 1995. ISBN# 0-471-12094

EE772: Restructuring and deregulation of power system (CT-II)

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

- The organization of the electric sector in the world has been changing dramatically to allow for competition among generators and to create market condition in the sector, seen as necessary conditions for increasing the efficiency of electric energy production and distribution, offering a lower price, higher quality and secure product.
- This course is aimed at providing a basic understanding to different types of power system restructuring process of the world.
- The course also addresses the very important issues arising after the restructuring of the power system and their remedies.

B. Outline of the Course:

Sr. No.	Title of Unit	Hrs
1	Introduction to Deregulation in Power System	02
2	Power System Restructuring Model	03
3	Available Transfer Capability (ATC)	10
4	Congestion Management	10
5	Transmission Pricing	05
6	Ancillary Services	10
7	Optimal Bidding in Restructured Power System	05

Total hours (Theory) : 45
Total hours (Lab) : 30
Total hours :75

C. Detailed Syllabus:

1. **Introduction to Deregulation in Power System** **02 Hours** **4.44%**

   Concepts of regulation and deregulation, Characteristic of regulated power system, Need to restructured the power system, Overview of a deregulated industry, Disaggregation of traditionally vertically integrated utility, Structure of deregulated power system, Different entities in deregulated power system, Responsibilities of independent system operator, Trading arrangements: Pool, Bilateral, Multilateral, Power Exchange, Energy auction and market clearing prices

2. **Power System Restructuring Model** **03 Hours** **6.66%**

   Classification of market models, Models based on energy trading, Models based on contractual agreements, Models based on ISO, Market operations, Day-Ahead and Hour-ahead markets, Elastic and Inelastic market, Market power, Vertical and horizontal market power, Measuring market power

3. **Available Transfer Capability (ATC)** **10 Hours** **22.22%**

   Definition of ATC, Criteria for ATC evaluation, Methods of ATC calculation, Power transfer distribution factor (PTDF) and Line outage distribution factor (LODF), Optimal power flow (OPF), Continuation power flow (CPF), Open Access Same-Time Information System (OASIS), Structure of OASIS, Functionality of OASIS, Posting of information on OASIS, Information requirement of OASIS

4. **Congestion Management** **10 Hours** **22.22%**

   Definition and effects of congestion in restructured power system, General methodologies for congestion management, Transaction curtailment, Transmission capacity reservation, System re-dispatch, Overall congestion management process, Methods for congestion management, Available transfer capability (ATC), Price area congestion management, Optimal power flow (OPF), Formulation of intra-zonal and inter-zonal problem for congestion management, Market based dynamic congestion management

5. **Transmission Pricing** **05 Hours** **11.11%**

   Cost component of transmission system, Pricing of transmission service, Transmission pricing methods

6. **Ancillary services** **10 Hours** **22.22%**

Ancillary services in restructured power system, Global overview of ancillary service management, Reactive power as an ancillary services, Reactive power placement analysis, Nodal pricing of reactive power, Costing and pricing of third party reactive power support, Synchronous generator as an ancillary service provider, Frequency regulation as an ancillary service, Spinning reserve service, Black start capability service

7. **Optimal Bidding in Restructured Power System** **05 Hours** **11.11%**

Game theory – an overview, Framing of bidding problem in game theory, Example, Optimization based approach for making bidding, Optimization based market simulator, Market prices with GENCOs behavior, Markov decision process

D. Instructional Methods and Pedagogy

- At the start of course, the course delivery pattern, pre-requisite of the subject will be discussed.
- Lecturers will be conducted with aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which carries 10 marks in overall evaluation.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students for each unit and will be evaluated at regular interval. It carries a weightage of 5 marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lecturers.

E. Student Learning Outcomes / objectives:

At the end of course, the students will acquire the knowledge regarding the benefits of restructured power system, its problems and remedial measures.

F. Recommended Study Material:

Books:

1. L. L. Lai, Power System Restructuring and Deregulation, John Wiley & Sons, UK, 2001.
2. M. Shahidehpour and M. Alomoush, Restructured Electrical Power Systems, Operation, Trading, and Volatility, Marcel Dekker, 2001.
3. K. Bhattacharya, M. H. J. Bollen and J. E. Daalder, Operation of Restructured Power Systems, Kluwer Academic Publishers, 2001.
4. Yong-Hua Song and Xi-Fan Wang (Eds), Operation of Market-oriented Power Systems, Springer, 2003

HS702ACADEMIC WRITING AND COMMUNICATION SKILLS

Credits and Schemes:

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
				Contact Hours/Week	Theory		Practical		Total
					Internal	External	Internal	External	
II	HS702	Academic Writing and Communication Skills	02	02	--	--	30	70	100

A. Course Objectives

To facilitate learners to:

- Understand how communications work
- Explore theconcepts ofcommunication skills
- Learn and practice cover letter and resume
- Explore and demonstrate professional communication skills
- Understand the concept and application of academic writing
- Understand the concept and application of group discussion
- Understand the concept and application of personal interview

B. Course Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**Basics of Communication Skills** • *Meaning and Definition of Communication* • *Concept and Process of Communication* • *Types and Levels of Communication* • *Principles of Effective Communication*	02
2	**Communication for Career Building** • *Cover Letter & Resume Building* • *Group Discussion* • *Interviews*	06
3	**Professional Communication Skills** • *Presentation Skills* • *Letter Writing*	06
4	**Academic Writing 1** • *Introduction to Academic Writing* • *Anatomy of Academic Writing* • *Organizing paragraphs* • *Using and Citing Sources of Ideas*	08
5	**Academic Writing 2** • *Project/Report/Dissertation/Paper Writing* • *Resources for honing academic writing*	08
	Total	30

C. Instruction Methods and Pedagogy

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

D. Evaluation

The students will be evaluated continuously in the form of their consistent performance throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 30 marks for internal evaluation and 70 marks for external evaluation.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Journal / Practical Performance	-	25	25
2	Attendance and Class Participation			05
			Total	**30**

External Evaluation

The University Practical Examination will be for 70 marks and will test the professional communication skills and academic writing.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Viva / Practical	-	70	70
			Total	**70**

E. Learning Outcomes

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

- Understand and demonstrate communication skills and academic writing.
- Construct letters, cover letter and resumes.
- Demonstrate performing ability at group discussion and personal interview.
- Demonstrate thepresentation skills.
- demonstrate ability to work on project/report/dissertation/paper writing

F. Reference Books / Reading

- Writing Your Thesis (2nd Edition) by Paul Oliver, Sage
- Academic Writing for international students, Routledge
- Development Communication In Practice by Vilanilam V J, Sage
- Intercultural Communication by Mingsheng Li, Patel Fay, Sage
- Academic Writing: A Guide for Management Students and Researchers. Monipally, M.M. & Pawar, B.S. Sage. 2010. New Delhi
- www.owl.perdue.edu

EE782: ENERGY AUDITING AND MANAGEMENT (UE-II)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

Energy auditing and management is a course where a student will deal with various types of energy conservation schemes employed in industries, power stations, domestic and commercial areas. Also they will familiar with energy auditing and management procedures. The objectives of the course are:

- To learn practical and theoretical elements of energy auditing and management
- To be able to assess the benefits and drivers of an energy audit and have knowledge of the Energy Audit Process
- To understand how to plan and carry out an energy audit and be confident with the process of reviewing energy data in the energy audit process
- To Have knowledge of the equipment and key considerations required when carrying out an energy audit
- To be aware about the energy efficient technology and energy storage system

B. Outline of the Course:

Sr. No.	Title of Unit	Min. No. of Hrs
1	Electrical Energy Conservation	3
2	Electrical Energy Management	10
3	Financial Management	4
4	Energy Management & Audit	5
5	Energy Efficient Technologies In Electrical Systems	3
6	Energy Storage Systems	3
7	Case Studies.	2

Total hours (Theory): 30

C. Detailed Syllabus:

1 Electrical Energy Conservation **3 Hours** **11.33%**

1.1 **Energy Scenario:** Introduction to energy science and energy technology, various forms of energy. Law of conservation of energy. Energy scenario of India, Introduction to global energy scenario. Carbon credit, Energy Sector Reforms, Energy Strategy for the Future, Energy Conservation Act 2001 and its features.

1.2 **Measures for energy conservation:**
Potential energy conservation opportunities in: HVAC System, Lighting systems, Motors and Transformers.

2 Electrical Energy Management **10 Hours** **29.12%**

2.1 Concept of energy management, Design of Energy management programmes, energy cost, Energy planning, Energy staffing, Energy Organization, Energy Requirement, Energy Costing, Energy Budgeting, Energy Monitoring, Energy consciousness, Energy Management Professionals, Environment pollution due to energy use. Need of energy planning, steps for energy planning, Energy management in industry, Energy management cell function and objective, Energy management cell roles and responsibilities, Role of energy manager, benchmarking, Social and economic cost benefits. Seven principals of energy management.

2.2 **Electrical System Optimization**
Electricity rate tariff, key to reduction in electrical energy Consumption, Methods to improve plant power factor, load management, conduction loss, switching loss, magnetic loss, harmonic Compensation, Motor control, Lighting energy saving.

2.3 **Cogeneration**
Definition, Need, Application, Advantages, Classification, Saving potentials

3 Financial Management **4 Hours** **11.11%**

Investment-need, Appraisal and criteria, Financial analysis techniques-Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis; Role of ESCOs.

4. Energy Management & Audit **5 Hours** **12.89%**

Introduction, Definition, Energy audit- needs, types and walkthrough energy audit. Energy audit at unit level, Industrial Audit approaches. Procedure for energy audit and equipments required. Comprehensive Energy audit Site testing Measurement & Analysis of Electrical System like Induction Motors. Transformers, Illumination system, Problems on Energy Management.

5. Energy Efficient Technologies In Electrical Systems **3 Hours** **11.11%**

Load Management and Maximum demand control. Electrical distribution system. Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls.

6. Energy Storage Systems **3 Hours** **13.33%**

Introduction, Demand for energy storage, Energy storage systems: heat storage- hot water, hot solids, phase change materials; Potential energy storage: spring, compressed gas. Pumped hydro: Flywheels. Rolling mills, Electrical and magnetic energy storage systems.

7. Case Studies. 2 Hours 11.11%

D. Instructional Methods and Pedagogy

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures which carries a component of the overall evaluation.
- Minimum two internal exams will be conducted and will be considered as a part of overall evaluation.
- Assignments based on course content will be given to the students for each unit/topic and will be evaluated at regular interval and its weightage may be reflected in the overall evaluation.

E. Student Learning Outcomes:

After the completion of the course the students will be able to:

1. Analyze about energy scenario nationwide and worldwide
2. Decide about energy management in more effective way.
3. To propose the effective way for energy conservation
4. Carry out financial management.
5. Can design energy efficient technologies and provide alternative solutions for energy storage

F. Recommended Study Material:

❖ **Text Book:**

1. Amlan Chakrabarti, Energy engineering and management, PHI Learning Private Limited.
2. K. Nagabhusan Raju, Industrial Energy Conservation Techniques, Atlantic Publishers & Distributors (P) Ltd.

❖ **Reference Book:**

1. Renewable energy sources and conservation technology By- N.K.Bansal, Kleemann and Meliss
2. Non – conventional energy sources by G.D. Rai
3. Energy technology by S.Rao.
4. A guide to energy management by Barney L Capehart, William J Kennedy, Wayne C Turner.

❖ **Web Material:**

1. www.energymanagertraining.com
2. www.bee-india.gov.in

CE771: PROJECT MANAGEMENT (UE-II)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course:

The course aims to provide and understanding management issues process during project management.

- To develop an awareness of the need for project planning and management
- To apply professional attitudes and techniques to managing a project
- Provide students with a basic understanding of project management principles and practices.
- Increase the student's ability to function effectively on a project team.
- Increase the student's ability to function effectively as a project manager.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Overview of Project Management	03
2	Project Management Concepts and Techniques	03
3	Project Cost Estimation	04
4	Project Planning and Scheduling	05
5	Project Monitoring and Control	05
6	Material Management in Project	04
7	Management of Special Projects and Project	06

Total hours (Theory): 30

C. Detailed Syllabus:

1.	**Overview of Project Management** Introduction to Project Management Overview of Project Planning, Project Estimation, Project Scheduling, Organization and Team Structure, Risk Analysis and Management, Resource Allocation Project Management Process and Role of Project Manager	**03 Hours**	**10 %**
2.	**Project Management Concepts and Techniques** Project Screening and Selection Techniques Structuring Concepts and Tools (WBS,ORS,LRC) Project Planning Tools (Bar Chart, LOB, CPM and PERT) Risk Analysis and Management	**03 Hours**	**10 %**
3.	**Project Cost Estimation** Types of Estimates and Estimating Methods Project Budgeting	**04 Hours**	**13 %**
4.	**Project Planning and Scheduling** Dynamic Project Planning and Scheduling Project Scheduling with Resource Constraints	**05 Hours**	**17 %**
5.	**Project Monitoring and Control** Monitoring Techniques and Time control system Project Cost Control and Time cost tradeoff	**05 Hours**	**17 %**
6.	**Material Management in Project** Project Procurement and Material Management	**04 Hours**	**13 %**
7.	**Management of Special Projects and Project Management Software Tools** Management of SE/NPD/R&D/Hi-Tech and Mega Projects Software tools for Project Management: MS Project, Primavera, Turbo Project, Riski Project.	**06 Hours**	**20 %**

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.

- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcomes:

Upon successful completion of this course, students will be able to understand project management process and different aspect of development process necessary for the management of the project which includes various activities, resources, quality, cost and system configuration etc.

F. Recommended Study Material:

❖ **Text Books:**

1. Project management: engineering, technology, and implementation by Shtub, Avraham, Jonathan F. Bard, and Shlomo Globerson, Prentice-Hall, Inc., 1994.
2. Project Management Handbook by Lock, Gower.
3. VNR Project Management Handbook by Cleland and King.
4. Management guide to PERT/CPM by Wiest and Levy, PHI.
5. Project Management: A Systemic Approach to Planning, Scheduling and Controlling by Horald Kerzner, CBS Publishers, 2002.
6. Project Scheduling and Monitoring in Practice by S. Choudhury,
7. Total Project Management: The Indian Context by P. K. Joy, Macmillan India Ltd.

❖ **Reference Books:**

1. Project Management for Business and Technology: Principles and Practice by John M Nicholas, Prentice Hall of India, 2002.
2. Project Management, by N. J. Smith (Ed), Blackwell Publishing, 2002.
3. Effective Project Management by Robert K. Wysocki, Robert Back Jr. and David B. Crane, John Wiley, 2002.
4. Project Management: A Managerial Approach, by Jack R Meredith and Samuel J Mantel, John Wiley, 4th Edition, 2000.

IT771: CYBER SECURITY AND LAWS (UE-II)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	02	00	02	02
Marks	100	-	100	

A. Objective of the Course:

The main objectives for offering the course Cyber Security are

- To under the concepts of Cybercrimes and cyber security
- To create the awareness of how to avoid becoming victims of cybercrimes.
- To provides the content which will help the students who wish to seek career in cyber security or independent study and research in the field of cyber security.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Computer and Cyber Security Basics	06
2.	Security Threats	09
3.	Provisions in Indian Laws in dealing with Cyber Crimes	07
4.	Case Studies	08

Total hours (Theory): 30

D. Detailed Syllabus:

1. **Computer and Cyber Security Basics** **06 hours** **20 %**

   Introduction to Computers, Computer History, Software, Hardware, Classification, Computer Input-Output Devices, Windows, DOS Prompt Commands, Basic Computer Terminology, Internet, Networking, Computer Storage, Computer Ethics and Application Programs, Security : Security trends –Goal, Attacks, Services and Mechanism

2. **Security Threats** **09 hours** **30 %**

   Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

3. **Provisions in Indian Laws in dealing with Cyber Crimes** **07 hours** **23 %**

   Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law.

4. **Case Studies** **08 hours** **27 %**

   Identity Management, Cyber Security and Terrorism: Case Studies, The DigiNotar case, Deutsche Telekom, The disruption at the IT service provider Tieto, Web Based Attacks by Symantec, Password Security

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- **Assignments** based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of **5 Marks** as a part of internal theory evaluation.

- Surprise Tests/Quizzes/Seminar/**Case Study** will be conducted which carries **10 Marks** as a part of internal theory evaluation.

E. Student Learning Outcome:

Learning outcomes of the course are:

- Students will able to do classification of cybercrime, methods used to perform crime, apply cyber security, and know the detailing of Information Technology Acts against offences.
- Students will understand and appreciate the legal and ethical environment impacting individuals as well as business organizations and have an understanding of the ethical implications of IT legal decisions.
- Students will have a fundamental knowledge of Information Technologies which affect organizational processes and decision-making.

F. Recommended Study Material:

❖ **Reference Books:**

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
5. CHANDER, HARISH," Cyber Laws And It Protection " , PHI Learning Private Limited ,Delhi ,India

CA 842: MOBILE APPLICATION DEVELOPMENT (UE-II)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. **Objective:** Develop skills to describe mobile technologies, mobile environment and todevelop Android application for mobile device using Android SDK, android application resource, application component, and Android APIs.

Prerequisites: Object Oriented Programming.

Methodology & Pedagogy: This course focuses on providing hands-on experience in designing and development of mobile application with emphasis on the real world application and techniques that enable smart phone based application development. Student shall also develop applications dealing with data storage, documents sharing among applications and application based on Google maps and integration of web service with mobile application.

Learning Outcomes:

- Describe the different mobile technologies, mobile development platform and mobile GUI.
- Comprehend how Android applications works, their life cycle, Intents, fragments and resources.
- Design and develop useful Android applications with compelling user interfaces by using View, ViewGroup, menu, and dialog elements.
- Use Android's APIs for data storage, retrieval, user preferences, files, databases, and content providers.
- Utilize the power of background services, notifications, and broadcast receiver.
- Use Android's communication APIs for SMS, telephony and location based application.

B. Outline of the Course:

Week No	Practical	Description
1	Brief about mobile technologies and challenges in mobile application development and architectural overview of an Android platform.	Different mobile application development platform overview and Android architecture overview and basic components of Android application development overview.
2	Development of first Android based mobile application and overview of	Working of Android Studio IDE, Android project directory structure, Dalvik Virtual Machine Overview, Android Software development kit explanation, Virtual

	necessary components required for development.	device creation and execution of first application on virtual as well as actual device
3	Fundamentals of User Interface designing.	XML based user interface designing using different available layouts like Relative Layout, Linear Layout, Table Layout etc.
4	User Interface Widgets-1	Hands-on demonstration of basic widgets like- TextView, EditText, Button, ToggleButton, RadioButton, RadioGroup, CheckBox, RatingBar, SeekBar etc.
5	User Interface Widgets-2	Hands-on demonstration of composite widgets like- ListView, Spinner and AutoCompleteTextView and customization of the composite controls.
6	Activity, Activity navigation and Intents.	Activity life cycle, Linking Activity using Intents:startActivity(), StartActivityForResult(). Calling built-in applications: ACTION_MAIN, ACTION_VIEW, ACTION_DIAL, ACTION_SEND
7	Android Resources, Styles and Themes.	Usage and implementation of different resources like drawable, string, color, dimes, raw and animation. Creating and Applying simple Style, Inheriting built-inStyle and User defined style, Using Styles as themes.
8	Dialogs & Menus.	Hands-on demonstration of different dialogs and menus available in Android.
9	Data Persistence Techniques.	User Preferences and Database management through SQLite
10	Broadcast Actions and Services implementation.	Service: life cycle, create and destroy service, Alarm Manager and SMS Manager. Standard Broadcast Actions.
11	PHP based web service implementation in Android	Creation and consumption of PHP based web service.
12	Simple Google Map incorporation with Android application.	Google Developer console usage, SHA-1 certificate creation and API-KEY creation and incorporation in Android application.

Total hours (Theory): 30

❖ **Text Books:**

1. Wei-Meng Lee: Beginning Android 4 Application Development, Wiley India Pvt Ltd.
2. Mark L. Murphy: The Busy Coder's Guide to Android Development

Reference Books:

1. Jonathan Simon: Head First Android Development, O'REILLY publication
2. Mark L Murphy: Beginning Android, Wiley India Pvt. Ltd.

Web References:

1. https://developer.android.com [Detail Android Development Guide]
2. https://www.youtube.com/watch?v=SUOWNXGRc6g&list=PL2F07DBCDCC01493A [200 android development tutorials]
3. www.androidhive.info/ [Advance application development with Android]

PT796: FITNESS AND NUTRITION (UE-II)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the course:

This course is intended to introduce the student with the basic concepts of health and fitness and appraise the relative contribution of leading a physically active lifestyle. This shall familiarize the student with different perspectives on maintaining general health and fitness behavior and understand the nutritional information to suit individual needs and preferences.

Upon completion of this course, the student should be able to:

1. To provide general concepts of physical education, nutrition and fitness.
2. To promote and understanding of the value of sports for life skill development.
3. Introduce nutritional principles and application to improve overall health.

B. Outline of the course:

S. No.	Title of the unit	Minimum number of hours
1.	Physical Education and Physical Fitness	10
2.	Nutrition and Health	10
3.	Sports and Life Skills Education	10

Total hours (Theory): 30

C. Detailed syllabus:

1 PHYSICAL EDUCATION AND PHYSICAL FITNESS 10 hours

1.1. Concept of Physical Education, Meaning, Definition, Aims and Objectives of Physical Education, Need and Importance of Physical Education

1.2 Physical Education and its Relevance in Inter Disciplinary Context

1.3 Physical Fitness Components: Type of Fitness, Health Related Physical Fitness, Performance Related Physical Fitness

2 NUTRITION AND HEALTH 10 hours

2.1 Concept of Food and Nutrition, Balanced Diet, Food Pyramid Index

2.2 Macro and Micronutrients: Types, functions and classification system

2.3 Carbohydrates : Types, RDA data, Glycemic index, Sources of Fats, saturated, unsaturated fats, recommended intake, importance of fat in diet, fats in health and disease

2.4 Protein: Types EAA, function, assessing quality of proteins, selecting incomplete proteins, RDA sources.

2.5 Vitamins And Minerals: Types, functions, sources, and minerals - calcium, Phosphorus, iron, magnesium, sodium, potassium, and chloride. Trace elements - sources and functions.

2.6 Determining Caloric Intake and Expenditure, Obesity, Causes and Preventing Measures – Role of Diet and Exercise, Importance of hydration in exercise

3 SPORTS AND LIFE SKILLS EDUCATION 10 hours

3.1 Sports and Socialization

3.2 Physical Activity and Sport – Emotional Adjustment and Wellbeing

3.3 Substance Abuse among Youth – Preventive Measures and Remediation

3.4 Yoga, Meditation and Relaxation

3.5 Sports and Character Building

3.6 Values in Sports

3.7 Sports for World Peace and International Understanding

D. Instructional Method And Pedagogy:

- Interactive classroom sessions using black-board and audio-visual aids.
- Using the available technology and resources for e-learning.
- Students will be encouraged towards self-learning and under direct interaction with course faculty.
- Students will be enabled for continuous evaluation.
- Case study, didactic mode of group discussions

E. Student Learning Outcomes:

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

- Appraise the importance of exercise in maintenance of health and fitness.
- Objectively define health and fitness in realistic environment and inculcate habits of physical activity, nutrition and sports as a behavior change and overall health promotion

F. Recommended Study Material:

❖ **Textbooks:**

1. ACSM"s "Health Related Physical Fitness Assessment Manual Lippincott Williams and Walkins USA, 2005.
2. Siedentop.D,(1994) Introduction to Physical Education and Sports (2nd ed.), California: Mayfield Publishing Company.
3. Corbin.Charles Beetal. C.A., (2004) Concepts of Fitness and Welfare Boston McGraw Hill.

NR 752: EPIDEMIOLOGY AND COMMUNITY HEALTH (UE-II)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. **Course Objectives:**

Upon completing the course, students will be able to

- Familiar with epidemiologic terminology, outcome measures, and study designs; to appreciate application of epidemiology to subfields (e.g., infectious diseases, reproductive health, genetics); and to apply epidemiologic methods to current public health issues.

B. **Outline of the Course:**

UnitNo.	Title of Unit	Prescribed Hours
1	**Introduction:** • Concept, scope, definition, trends, History and development of modern Epidemiology • Contribution of epidemiology • Implications	5
2	**Health Statistics:** • Morbidity & Mortality	2
3	**Epidemiological approaches:** • Study of disease causatives (Cause & Risk) • Health promotion • Levels of prevention	4
4	**Epidemiology of** • Communicable diseases • Non-communicable diseases	10
5	**Disaster:** • Disaster preparedness, • Disaster management	3
6	**Health Organizations:** • Voluntary health organizations • International health agencies –WHO, World health assembly, UNICEF, UNFPA, SIDA, US AID, DANIDA, DFID. AusAID etc	6
	Total	**30 Hours**

C. **Instruction Method and Pedagogy**

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, microteaching, task-based learning, assignments, field visit and various interpersonal activities like group work, independent and collaborative research, presentations etc.

D. **Evaluation:**

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 25 marks for internal evaluation and 75 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Assignments	1	8	8
2	Internal Test/ Model Exam	1	12	12
3	Attendance and Class Participation	Minimum 80% attendance		10
			Total	**30**

External Evaluation

The University Theory examination will be of 75 marks and will test the logic and critical thinking skills of the students by asking them theoretical as well as application based questions. The examination will avoid, as far as possible, grammatical errors and will focus on applications.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

E. **Learning Outcomes:** At the end of the course, learners will be able to:

- Understand the epidemiologic terminology,
- Understand the health statistic
- Understand the various methods of epidemiology
- Understand the role and functions of various health agencies
- Understand the epidemiological trends in communicable and non-communicable diseases.

OC733: INTRODUCTION TO POLYMER SCIENCE (UE-II)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the course

Fundamentals of polymer chemistry will be introduced.

B. Outline of the course

Sr.No	Title of Unit	Approximate No of Hours
1	Basic concepts of Polymer Chemistry	5
2	Chemistry of Polymerization	8
3	Kinetics of polymerization	8
4	Molecular weight and size	9

Total Hours (Theory): 30

C. Detailed syllabus:

Sr. No	Title of Unit	Approximate No of Hours
1.	**Basic concepts of Polymer Chemistry** Introduction to polymers, How are polymers made, Classification of polymers.	5
2.	**Chemistry of Polymerization** Chain polymerization, Step polymerization, Miscellaneous polymerization reactions, Polymerization techniques.	8
3.	**Kinetics of polymerization** i). Free – Radical chain polymerization. ii). Cationic & anionic polymerization. iii). Polycondensation	8
4.	**Molecular weight and size** Number – Average molecular weight. Viscosity – Average molecular weight. Polydispersity and molecular weight. Significance of polymer molecular weight. Size of polymer molecules	9

D. Instrumental Methods and Pedagogy:

Topics will be taught in interactive class room sessions using black-board and if required power-point presentations will also be employed. Special interactive problem solving sessions will be conducted. Course materials will be provided from various sources of information. Students will be trained to measure molecular weight of polymers using appropriate instrument(s). Unit test will be taken regularly as a part of continuous

evaluation and suggestions will be given to the students in order to do better in their performance.

E. Student Learning Outcomes/Objective:

- The programme aims at providing the basic concepts in polymer science.
- Ensuring that students acquire skills for further research in this area.

F. References:

1. A First Course in Polymer Chemistry by A. Strepikheyev , V.Derevitskaya and G.Slonimsky ; MIR Publishers, Moscow
2. Polymer Science by V.R.Gowariker , N.V.Viswanathan and Jayadev Sreedhar, New Age International Publishers.
3. Polymer Science and Technology of Plastics and Rubbers by Premamoy Ghosh, Tata McGraw-Hill Publishing Company Ltd. New Delhi.

MB651: SOFTWARE BASED STATISTICAL ANALYSIS (UE-II)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Course Objectives

The objectives of this course are:

- To enable the students to understand importance of research and statistical techniques.
- To provide hands on training of statistical software like SPSS, SYSTAT, MATLAB and other open source software like R , WEKA, for research.

B. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	**Introduction to Statistics** • Research and Innovation • Introduction to Statistics • Quantitative Techniques in Research	06
2	**Software # 1 - Use of Software in Research** • Introduction to the Software • Creating Variables • Data and its Types • Importing Data from MS-Excel • Transformation of Variables • Visual Benning • Determining Validity and Reliability of Scale using CFA - Cronbach's (alpha) : a coefficient of internal consistency • Estimation & Hypothesis Testing: • Parametric Tests o Z Test o t – Test o Cross Tabulation and Chi – square o One-Way & Two-Way Analysis of Variance (ANOVA) o Pearson's Correlation Analysis o Regression Analysis o Simple & Multiple Linear Regression Analysis o Measures of Model Fit (R and R-square Statistics)	12

Module No.	Title/Topic	Classroom Contact Sessions
	• Non-Parametric Tests o Mann-Whitney U Test o Wilcoxon Signed Rank Test o Run test o Krushal-Wallis Test o Spearman Correlation Analysis	
3	**Statistical Analysis Using Open Source software** • Introduction to Software • Programming Language Basics – including creating, sub-setting and analyzing • Managing your files and workspace • Controlling functions (procedures or commands) • Data Acquisition – Reading files • Data Transformations • Selecting variables and observations • Writing functions (macros) • Graphics	10
4	**Article / Research Papers Reviews**	02
	Total	30

C. Pedagogy

The course will emphasise self-learning and active classroom interaction based on students' prior preparation. The course instructor is expected to prepare a detailed session-wise schedule, showing the topics to be covered, the reading material and case material for every session. Wherever the material for any session is drawn from sources beyond the prescribed text-book, reference books, journals and magazines in the library, or from websites and other resources not accessible to the students, the course instructor should make the material available to the students well in advance, so that the students can come prepared for the classes. The pedagogical mix will be as follows:

- Classroom / Practical Contact Sessions ... About 28 Sessions
- Research Paper Discussions / Feedback ... About 02 Sessions

The exact division among the above components will be announced by the instructor at the beginning of the semester as a part of detailed session-wise schedule.

D. Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks	Percentage of total internal evaluation
1	Quizzes	3	10	30	10
2	Assignment / Project work	1	150	150	50
3	Internal Tests	2	45	90	30
4	Attendance and Class Participation			30	10
			Total	300	100

The total marks will be divided by 10 and declared as Institute-level evaluation marks for the course. The Institute-level evaluation will constitute 30% of the total marks f or the course.

E. External Evaluation

The University examination will be for 70 marks and will be based on practical computer-based tests and a viva-voce.

F. Learning Outcomes

At the end of the course, the student should have developed:

- Skills related to use of statistical techniques for analysis using software
- Rational decision making skills for typical business / other decisions
- Inputs for reviewing articles / research papers especially related to use of statistical techniques and analysis based on software

G. Reference Material

❖ **Text-book**

1. Latest Manuals of Software

❖ **Reference Books**

1. David .M. Levine, Krehbiel, Berenson, P.K. Viswanathan, (Latest Edition), Business Statistics – A First Course, (Latest Edition), Pearson Education

MA 772: DESIGN OF EXPERIMENTS (UE-II)

Credits and Hours:

Teaching Scheme	Theory	Practical/Tutorial	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objective of the Course:

The course is designed for Engineers, Physicists, Chemists, Mathematician. This course covers basics of Statistics and Experimental Design.

The objectives of the course are to:

1. Understand basics of Statistical Techniques of Design of Experiment
2. Understand the applications of experimental design in practice

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Principles of Experimental Design	06
2.	Statistical Concepts	06
3.	Single Factor Experiments	08
4.	Factorial Experiments	10

Total hours (Theory): 30

C. **Detailed Syllabus:**

1	**Principles of Experimental Design**	**06 Hours**	**20%**
1.1	Basic Terminologies: Types of Investigations and Experiments		
1.2	Confirmatory and Exploratory Experiments		
1.3	Modeling and selecting Response		
1.4	Minimizing Bias and Variability		
2	**Statistical Concepts**	**06 Hours**	**20%**
2.1	Descriptive Statistics and Graphical Presentation		
2.2	Probability Distributions, Hypothesis Tests and Confidence Intervals		
2.3	Power and Sample size calculation		
2.4	Experiments for Two Treatments		
2.5	Linear Regression: Simple and Multiple		
3.	**Single Factor Experiments**	**08 Hours**	**30%**
3.1	Completely Randomized Designs		
3.1	Concepts of Multiple comparison		
3.2	Pairwise Comparisons		
3.3	Comparisons with a Control		
3.4	General Contrast		
4.	**Factorial Experiments**	**10Hours**	**30%**
4.1	Inference from Factorial Experiments		
4.2	Two-Level Factorial Experiments		
4.3	Definition and Estimation of Main Effects and Interactions		
4.4	Statistical Analysis		
4.5	Two-Level Fractional Factorial Experiments: Introduction		

D. **Instructional Method and Pedagogy:**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weighting of 5%.
- Two Quizzes (surprise test) will be conducted which carries 5% component of the overall evaluation.

E. **Student Learning Outcomes:**

- At the end of the course the students will be able to understand the basic concepts of Design of Experiment.
- Student will be able to apply concepts of these course in their study of specialization

F. Recommended Study Material:

❖ **Text Books:**

1. Tamhane, Ajit C. Statistical analysis of designed experiments: theory and applications. Vol. 609. John Wiley & Sons, 2009.
2. Hinkelmann, Klaus, and Oscar Kempthorne. Design and Analysis of Experiments, Introduction to Experimental Design. Vol. 1. John Wiley & Sons, 2008.
3. Lorenzen, Thomas, and Virgil Anderson, eds. *Design of experiments: a no-name approach*. CRC Press, 1993.

❖ **Reference Books:**

1. Cox, David Roxbee, and Nancy Reid. *The theory of the design of experiments*. CRC Press, 2000.
2. Goupy, Jacques L. *Methods for experimental design: principles and applications for physicists and chemists*. Vol. 12. Elsevier, 1993.

PH826: INTELLECTUAL PROPERTY RIGHTS (UE-II)

Credits and Hours:

Teaching scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the course:

- To acquaint the students with the basic concepts of Intellectual Property Rights;
- To develop expertise in IPR related issues,
- To sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR, and;
- To explore practical aspects repeated to patenting.

B. Outline of the course:

Sr. No.	Title of Unit	No. of Contact Hours.
1	Intellectual Property Concepts	5
2	IPR and Research	5
3	Practical aspect of patenting	10
4	IPR related treaties	5
5	Case Study	5

Total Hours (Theory): 30

C. Syllabus Topics:

Sr. No.	Title of Unit	Topics
1	Intellectual Property Concepts	• Concept of property, conventional property vs. Intellectual Property • Basic aspect of the 8 different IPR mechanism Viz. Patents, Copyright, trademark, industrial design, layout design of integrated circuits, geographical indicators, plant varieties & trade secrets.
2	IPR and Research	• Benefits of IPRs to improve the quality of research work • Strategies for avoiding research duplications, infringements
3	Practical aspect of patenting	• Indian patent act and its recent amendment with respect to following aspect: Patentable and non-patentable inventions, Essential criteria for filing a patent, Filling a patent in India and abroad, Drafting of patent application • Patent Filling and Commercialization: Procedure for patent obtaining in India, National and International Patent Search, Patent Analysis, Patent Drafting and Filling Procedure in India, Patent Specification and Claims, How to right a Claim of Patent, Pre/Post Grant Issues in Patenting, Opposition of Patent Granting, Infringement Analysis, Ground of Defense, Intellectual Property Appellation Board (IPAB), International Filing: PCT System • Patent and Biodiversity Act • Introduction to World Intellectual Property Organization. (WIPO) • Commercialization of patent: Need for Commercialization of research and role of IPRs in research Commercialization. • Benefit/Disadvantages of patenting to the society • Latest Amendment/Emerging Issues in Patenting
4	IPR related treaties	• Patent co-operative treaty • Budapest treaty
5	Case Study	

D. Instructional Methods and Pedagogy:

The course employs in interactive classroom session using chalk and talk teaching to power point presentations. It also includes presentation by students on a specific topic assigned to them by the faculty and case study discussion with various litigation, infringement and patent rejection cases. Unit test will be conducted regularly as a part of continuous evaluation and suggestion will be given to student in order to improve their performance.

E. Students Learning Outcomes/Objectives:

- At the end of the course, the student will be able to understand the fundamental concepts of Intellectual Property Rights which further will be helpful in understanding other advanced aspects of Patent and Trademark applications in various scientific research and innovation.
- At the end student would gain experience in filling and drafting procedure of Patent.

F. Recommended Study material

1. Intellectual Property Right basic Concept, by M. M. S. Khatri, Atlantic Publisher and Distributors Pvt. Ltd., New Delhi.
2. Epstein on Intellectual Property: 5th Edition by Michael M. Epstein, Wolters Kulwer India Pvt. Ltd. Gurgaon, India.
3. Intellectual Property Right and Human Development in India by Shabana Talwar, First Edition, Serials Publications, New Delhi, India.
4. IPR Handbook for Pharma Students and Researchers, Parikshit Bansal, Pharma Book Syndicate, Hyderabad, India.
5. Patents, N. R. Subbaram, Pharma Book Syndicate, Hyderabad.
6. Intellectual Property Right by Nikolaus Thumm, Springer-Verlag Publications, Germany.
7. Intellectual Property - Patents, Copyright, TradeMarks and Allied Rights by Cornish, Aplin and Llewelyn, Sweet and Maxwell – Thomson Publishers, New Delhi, India
8. The Enforcement of Intellectual Property Rights: A Case Book by Louis Tc. Harms, WIPO Publishing House, Geneva.

Intellectual Property: From Creation to Commercialization - A Practical Guide for Innovators & Researchers by John P., MC Manus, Oak Tree Press, Ireland.

M. Tech. (Information Technology) Programme

SYLLABI

(Semester – 3)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT811: PROJECT PRELIMINARIES

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	0	4	4
Marks	200	0	200	

A. Objective of the Course:

The main objectives to give the subject Mathematical Methods for Computing & Research Methodology are:

- To provide additional mathematical skill useful for the research project work
- To develop and test one's ability to learn independently
- To provide exposure in the field of Research Methodology
- To provide a deep understanding of the area of mathematical methods for computer science.
- To provide an innovative ability to solve practical/utility problems of computer science

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1	Interpolation and Integration	06
2	Numerical solution of ordinary differential equation	06
3	Matrix Algebra	06
4	Research Methodology : An Introduction	03
5	Defining the Research Problem	03
6	Research Design	03
7	Sampling Design	03
8	Measurement and Scaling Techniques	03
9	Methods and Data Collection	03
10	Processing and Analysis of Data	03
11	Sampling Fundamentals	03
12	Testing of Hypotheses – I (Parametric or Standard Tests of Hypotheses)	03
13	Chi-Square Test	03
14	Analysis of Variance and Covariance	03
15	Testing of Hypotheses – II (Nonparametric or Distribution – free Tests)	03
16	Multivariate Analysis Techniques	03
17	Interpretation and Report Writing	03

Total hours (Theory): 60 Hrs
Total hours (Lab) : 00 Hrs.
Total hours : 60 Hrs

C. Detailed Syllabus:

1	**Interpolation and Integration**	**06 Hrs**	**7 %**

Newton's forward interpolation formula, Newton's backward interpolation formula, Langrange's interpolation formula, Numerical integration: Composite rules (Trapezoidal rule, Simpson's rules).

2	**Numerical solution of ordinary differential equation**	**06 Hrs**	**10 %**

Taylor series, Picard's, Euler's methods, Runge- Kutta method 4^{th} order.

3	**Matrix Algebra**	**06 Hrs**	**10 %**

Cofactor expansion of n×n determinant, Eigen values of matrices, Cayley - Hamilton theorem, special matrices viz., Symmetric, Skew-symmetric, Hermitian, skew Hermitian, Orthogonal and Unitary matrices.

4	**Research Methodology : An Introduction**	**03 Hrs**	**5 %**

Meaning of Research: Objectives of Research - Motivation in Research-Types of Research-Research Approaches-Significance of Research-Research Methods versus Methodology-Research and Scientific Method-Importance of Knowing How Research is Done-Research Process-Criteria of Good Research-Problems Encountered by Researchers in India

5	**Defining the Research Problem**	**03 Hrs**	**5 %**

What is a Research Problem? - Selecting the Problem-Necessity of Defining the Problem Technique Involved in Defining a Problem-An Illustration-Conclusion

6	**Research Design**	**03 Hrs**	**5 %**

Meaning of Research Design-Need for Research Design-Features of a Good Design-Important Concepts Relating to Research Design-Different Research Designs-Basic Principles of Experimental Designs-

7	**Sampling Design**	**03 Hrs**	**5 %**

Census and Sample Survey-Implications of a Sample Design- Steps in Sampling Design-Criteria of Selecting a Sampling Procedure-Characteristics of a Good Sample Design-Different Types of Sample Designs-How to Select a Random Sample?-random Sample from an Infinite Universe-Complex

Random Sampling Designs

8 Measurement and Scaling Techniques **03 Hrs** **5 %**

Measurement in Research-Measurement Scales-Sources of Error in Measurement-Tests of Sound Measurement-Technique of Developing Measurement Tools Scaling -Meaning of Scaling-Scale Classification Bases-Important Scaling Techniques-Scale Construction Techniques-

9 Methods and Data Collection **03 Hrs** **5 %**

Collection of Primary Data-Observation Method-Interview Method -Collection of Data through Questionnaires-Collection of Data through Schedules-Difference between Questionnaires and Schedules-Some Other Methods of Data Collection1-Collection of Secondary Data

10 Processing and Analysis of Data **03 Hrs** **5 %**

Processing Operations-Some Problems in Processing-Elements/Types of Analysis-Statistics in Research-Measures of Central Tendency-Measures of Dispersion-Measures of Asymmetry (Skewness)-Measures of Relationship-Simple Regression Analysis-Multiple Correlation and Regression-Partial Correlation-Association in Case of Attributes

11 Sampling Fundamentals **03 Hrs** **5 %**

Need for Sampling-Some Fundamental Definitions-Important Sampling Distributions-Central Limit Theorem-Sampling Theory-Sandler'sA-test-Concept of Standard Error-Estimation-Estimating the Population Mean μ -Estimating Population Proportion-Sample Size and its Determination-Determination of Sample Size through the Approach-Based on Precision Rate and Confidence Level-Determination of Sample Size through the Approach Based on Bayesian Statistics

12 Testing of Hypotheses – I (Parametric or Standard Tests of Hypotheses) **03 Hrs** **5 %**

What is a Hypothesis?- Basic Concepts Concerning Testing of Hypotheses-Procedure for Hypothesis Testing-Flow Diagram for Hypothesis Testing-Measuring the Power of a Hypothesis Test-Tests of Hypotheses-Important

Parametric Tests-Hypothesis Testing of Means-Hypothesis Testing for Differences between Means-Hypothesis Testing for Comparing Two Related Samples-Hypothesis Testing of Proportions-Hypothesis Testing for Difference between Proportions-Hypothesis Testing for Comparing a Variance to Some Hypothesized Population Variance

13 Chi-Square Test **03 Hrs** **5 %**

Chi-square as a Test for Comparing Variance-Chi-square as a Non-parametric Test-Conditions for the Application of $\chi 2$ Test-Steps Involved in Applying Chi-square Test-Alternative Formula-Yates' Correction-Conversion of$\chi 2$into Phi Coefficient-Conversion of$\chi 2$into Coefficient by Contingency-Important Characteristics of$\chi 2$Test-Caution in Using $\chi 2$ Test

14 Analysis of Variance and Covariance **03 Hrs** **5 %**

Analysis of Variance (ANOVA)- What is ANOVA?-The Basic Principle of ANOVA-ANOVA Technique-Setting up Analysis of Variance Table-Short-cut Method for One-way ANOVA-Coding Method-Two-way ANOVA-

15 Testing of Hypotheses – II (Nonparametric or Distribution – free Tests) **03 Hrs** **5 %**

Important Nonparametric or Distribution-free Test-Relationship between Spearman'sr's and Kendall's W -Characteristics of Distribution-free or Non-parametric Tests

16 Multivariate Analysis Techniques **03 Hrs** **5 %**

Growth of Multivariate Techniques-Characteristics and Applications-Classification of Multivariate Techniques-Variables in Multivariate Analysis-Important Multivariate Techniques-Important Methods of Factor Analysis-Rotation in Factor Analysis-R-type and Q-type Factor Analyses-Path Analysis

17 Interpretation and Report Writing **03 Hrs** **5 %**

Meaning of Interpretation-Why Interpretation?-Technique of Interpretation:- Precaution in Interpretation-Significance of Report Writing-Different Steps in Writing Report-Layout of the Research Report -Types of Reports-Oral Presentation-Mechanics of Writing Research Report-Precautions for Writing Research Reports

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.
- Students will select related topic based on subjects they learnt and other literatures like books, periodicals, journals and various internet resources.
- Students can select the topic based on the research areas of available supervisor/guide.

E. Student Learning Outcome:

- At the end of the course the student's gets exposure to design a research investigation that incorporates appropriate theoretical approaches, conceptual models, and a review of the existing literature.
- Students will explore the new ideas & the possible areas to work ahead.
- Student will learn the various research methodologies useful for doing project work.
- Student will learn to investigate the chosen topic in depth. This implies collecting and reviewing literature and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or project topic.
- Student will learn to apply the concepts and theories learnt in previous years of study and work placements.

F. Recommended Study Material:

- **Text Books:**
  1. Research Method (Methods & Techniques) – Second Revised Edition
  2. Erwin Kreyszig: Advanced Engineering Mathematics, 8/e, Jhon Wiley & Sons, 1999
  3. Wylie & Barrett: Advanced Engineering Mathematics, Mc graw Hill pub
  4. Greenberg M D: Advanced Engineering Mathematics, 2/e, Pearson Education By C.R.Khotari

IT812: PROJECT PHASE-I

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	-	32	32	18
Marks	-	500	500	

A. Objective of the Course:

- To develop and test one's ability to learn independently.
- To apply the concepts and theories learnt in previous years of study and work placements.
- To test one's ability to complete a substantial piece of work to a laid-down standard and within a given time period.
- To Identifying a topic and developing a research question or set of questions within an academically sound framework connected to specialization.
- To investigate the chosen topic in depth. This implies collecting and reviewing literature (e.g. books, papers, journals, websites, proceedings etc.) and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or thesis topic.
- To provide you with a blueprint for a successful project/dissertation.
- To demonstrate the blueprint and way to implementation and writing a successful dissertation before the project phase II starts.

B. Outline of the Course:

- The Project shall be related to the major field of his/her PG specialization work.
- The Project should be one of the major pieces of evidence that students are familiar with or that student wants to be familiar with. It should reflect your specialist subject by means of deep and sustained study.
- The project will be finalized by the department level Post Graduate Committee on recommendation of the supervisor(s).
- The project work shall be carried out by each candidate independently during the third and fourth semester under the guidance of one of the faculty members of the Department. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department.
- If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission to that effect and the name of co-guide at any of these organizations shall be intimated to the Post Graduate Committee at the beginning of third semester.
- Project I includes literature review, required theoretical input, study and comparison of various approaches for the proposed dissertation work.

C. Instructional Methods and Pedagogy:

- Student has to submit a project/dissertation proposal indicating the tentative title and broad outline of the proposed work and the name(s) of the supervisor(s) along-with their concurrence in writing within 30 days from the starting of the third semester.
- Utmost care should be taken in selection of research topic so that repetition of research work is avoided.
- Project - I will be evaluated at least once during the semester and at the end of the semester as a part of continuous evaluation.
- After successful completion of Project I only students are allowed to go register for Project – II.

D. Student Learning Outcomes / Objectives:

- Students will select a topic that is appropriate for his/her degree specialization.
- At the end of the course the student's gets exposure to construct and justify research questions related to the topic.
- Each student will be in a position to design a research investigation that incorporates appropriate theoretical approaches, conceptual models, and a review of the existing literature.
- Students will learn to structure a discussion in a coherent and convincing way by synthesizing the material in the context of the research questions.
- Students will be having sufficient collection of the literature/experimental data for the implantation/experimentation in project - II.

M. Tech. (Information Technology) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT813: PROJECT PHASE-II

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	-	36	36	30
Marks	-	1000	1000	

A. Objective of the Course:

- To provide an innovative ability to solve practical/utility problems.
- To provide a capacity to learn continually and interact with multidisciplinary groups.
- To interpret the research material of project – I in a critical manner and to proceed with an analysis/simulation/experimentation and critical review.
- To discover and provide a framework within which research is conducted so that student's answers are fact based and backed-up by solid information.
- To craft an extensive and comprehensive piece of written work so as to convey research in the most efficient and effective way and therefore confirm to the reader that the thesis is, as a minimum, of a worthy standard and quality.

B. Outline of the Course:

- Student should carry out the investigation by identifying sources of evidence, accessing those using accepted and rigorous academic methods, and analysing and interpreting the material gathered by simulation/experimentation.
- A project - II is student's own work & will need to keep up the effort, and the interest, over several months and through several stages.
- Student need to think carefully about the time necessary to carry-out and complete your project work and the relative writing up.
- The project should present an orderly and critical exposition of the existing knowledge of the subject and will embody results of original investigations demonstrating the capacity of the candidate to do independent research work.
- While writing the thesis/dissertation, the candidate will layout clearly the work done by him independently and the sources from which he has obtained other information contained in his/her Dissertation.

C. Instructional Methods and Pedagogy:

- Project - II will be evaluated at least once during the semester and at the end of the semester as a part of continuous evaluation.
- Before submission of Phase II project/dissertation report, it is expected from a student to publish at least one research paper in National/International conference. Further, for such publications, Department Post Graduate Committee will identify and approve the national/international conferences.
- The dissertation shall be submitted for 'dissertation – evaluation' ordinarily at the end of IV Semester and 'dissertation – open defense' shall be held soon after the submission of the dissertation.

D. Student Learning Outcomes / Objectives:

- At the end of the course the student's gets exposure to design a research investigation that incorporates appropriate theoretical approaches, conceptual models, and a review of the existing literature.
- Students will learn to structure a discussion in a coherent and convincing way by summarizing the key arguments and providing suitable and coherent findings.
- Student will be able to draw valid conclusions, relating them to the research topic.
- Students will write a comprehensive review of the literature, including a review of other dissertation research related to their study.
- Students develop a design of their study with a discussion of the methodology to be used including selection of a sample, instrumentation and its testing, sources of data and the data collection process.
- Students describe how their data will be treated and analysed and the significance and limitations of their study.