Faculty of Technology & Engineering
Master of Technology Programme
Computer Engineering
(M.Tech. CE)

ACADEMIC REGULATIONS & SYLLABUS

(Choice Based Credit System)

Academic Year: 2020-2021

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 (CE/CSE/ICT) Ph. D
	Devang Patel Institute of Technology and Research	B.Tech (CE/IT/CSE)
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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FACULTY OF TECHNOLOGY AND ENGINEERING
ACADEMIC REGULATIONS
Master of Technology 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	(M.Tech)
	Minimum	4 semesters (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 – I 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

7.2.1 A student shall be evaluated through Continuous Evaluation and Semester End Examination.

7.2.2 The weight of continuous assessment and End-semester examination shall be varying from UG to PG and from Faculty to Faculty as approved by Academic Council.

7.2.3 During the semester, a student shall be going through continuous assessment. The continuous assessment will be conducted by the respective Department / Institute. At the end of semester a student shall be evaluated through semester end examination comprising of theory and/or practical, viva-voce, term work components as decided by Academic Council.

7.2.4 The performance of candidate in continuous assessment and in end-semester examination together shall be considered for deciding the final grade in a course.

7.3 University Examination

7.3.1 The final examination by the University for 70% of the evaluation for the course will be through written paper and 100% for practical test or oral test or presentation by the student or a combination of any two or more of these.

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

7.4 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 grading system

8.1.1 At the end of a semester, a histogram shall be prepared for results of each course. A committee mentioned hereunder shall finalize the histogram based on which results will be prepared.

8.1.2 Result Preparation committee: A committee chaired by Provost and comprising of Dean of Faculty, One Dean other than the faculty and one teacher having expertise of relative grading shall deliberate upon different scenarios of results based on histograms of all the courses. Thereafter, the committee shall finalize the results.

8.1.3 The histogram shall be prepared for each course. After the finalization by the committee, the results shall be declared within 3 weeks duration.

8.1.4 Post Result Mechanism: The Dean shall discuss the result of each course with the convener and the teacher who has taught the course along with the statistical distribution evident from histogram so as to bring out any anomalies, skewness, left-out topics etc. Its only after this discussion is over the results shall be declared.

8.2 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;

9.1.4 **In addition to above, the student has to complete the required formalities as per the regulatory bodies, if any.**

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

11. 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 & ENGINEERING

A. Choice Based Credit System:

With the aim of incorporating the various guidelines initiated by the University Grants 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 Institute Elective Course (IE)

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

1.2.2 Programme Elective Course (PE):

A 'Programme Elective Course' is a course for the 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

1.2.3 Cluster Elective Course (CE):

A 'Institutional Elective Course' is a course which students can choose from the given set of functional course/ Area or Streams of Specialization

options (eg. Common Courses to EC/CE/IT/EE) as offered or decided by the Institute from time-to-time.

1.3 Non Credit Course (NC) - 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 & TECHNOLOGY

TEACHING & EXAMINATION SCHEME FOR M TECH PROGRAMME IN COMPUTER ENGINEERING

CHOICE BASED CREDIT SYSTEM

Sem	Course Code	Course Title	Teaching Scheme				Examination Scheme				
			Contact Hours			Credit	Theory		Practical		Total
			Theory	Practical	Total		Internal	External	Internal	External	
First Year Sem 1	CE741	Information & Network Security(PC-I)	3	2	5	4	30	70	25	25	150
	CE742	Data Mining & Business Intelligence(PC-II)	3	2	5	4	30	70	25	25	150
	CE743	Mobile Computing & Application Development(PC-III)	3	4	7	5	30	70	50	50	200
	CE766	Advanced data structure & Algorithms(PE-I)	3	2	5	4	30	70	25	25	150
	HS105.02A/HS141.02A	Academic speaking & presentation skill/French	0	2	2	2	0	0	30	70	100
	CE767	Operating System Design & Concepts(PCE-I)	3	2	5	4	30	70	25	25	150
	CE772.01	Research methodology(UE-I)	0	2	2	2	0	0	30	70	100
			15	**16**	**31**	**25**	**150**	**350**	**210**	**290**	**1000**
First Year Sem 2	CE744	Internet of Things(PC-I)	3	2	5	4	30	70	25	25	150
	CE745	Intelligent Networks (PC-II)	3	4	7	5	30	70	50	50	200
	CE746	Cloud Computing (PC-III)	3	2	5	4	30	70	25	25	150
	CE765	Machine Learning(PE-II)	3	2	5	4	30	70	25	25	150
	CE768	Software Project Management & Quality Assurance(PCE-II)	3	2	5	4	30	70	25	25	150
	HS106.02 A	Academic Writing	0	2	2	2	0	0	30	70	100
	CE771.01	Project Management(UE-II)	0	2	2	2	0	0	30	70	100
			15	**16**	**31**	**25**	**150**	**350**	**210**	**290**	**1000**

Note:

- **University Elective (UE):-** University Electives are offered in common slots and offered by various departments. Students of any programme can select these electives. Subjects like Research Methodology, Occupational Health & Safety, Engineering Economics, Professional Ethics, and Project Management, Disaster Management, Risk Management etc. can be included.

- **Cluster Elective (CT):-** Institutional Electives means common electives among a cluster of programmes (eg. CE/IT/EC/EE etc.). If Institutional Electives are not applicable, it will be Programme electives
- **Programme Elective (PE):-** Programme Electives are electives offered by the respective department.
- **Institute Elective (IE):-** Institute Electives are common electives offered at the institute level.
- **Programme Core(PC)**
- Provision for Auditing a course will be available
- Audit courses may be offered and decided based on need of the institute/program(s)

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)												
TEACHING & EXAMINATION SCHEME FOR M TECH PROGRAMME IN COMPUTER ENGINEERING												
CHOICE BASED CREDIT SYSTEM												
Sem	**Course Code**	**Course Title**	**Teaching Scheme**				**Examination Scheme**					
			Contact Hours			**Credit**	**Internal**		**External**			**Total**
			Theory	**Practical**	**Total**		**Progress Report**	**Progress Seminar**	**Report**	**Seminar**	**Viva - voice**	
S.Y Sem 3	CE811	Project Preliminaries	**0**	**4**	4	4	50	50	0	50	50	200
	CE812	Project Phase-I	**0**	**36**	36	18	100	100	100	100	100	500
			0	**40**	**40**	**22**	**150**	**150**	**100**	**150**	**150**	**700**
S.Y Sem 4	CE815	Project Phase-II	0	36	36	18	200	200	200	200	200	1000
			0	**36**	**36**	**18**	**200**	**200**	**200**	**200**	**200**	**1000**

M. Tech. (Computer Engineering) Programme

SYLLABI

(Semester – 1)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CE741: INFORMATION & NETWORK SECURITY(PC-I)

Credits and Hours:

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

A. Objective of the Course:

- To Understand basic issues, concepts, principles, and mechanisms in information security
- To know the methods of conventional encryption.
- To understand authentication and Hash functions.
- To analyze both early and contemporary threats to network security
- To identify and investigate threats to network security
- To understand how network security is conceptualized and carried out.
- Exposure to commercial as well as research security technologies.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction	02
2	Mathematics of Cryptography	03
3	Tradition Symmetric Key Ciphers	03
4	Introduction to Modern Symmetric Key Ciphers	04
5	Data Encryption Standard	05
6	Advanced Encryption Standard	04
7	Mathematics of Cryptography	04
8	Asymmetric Key Cryptography	04
9	Key Management	04
10	Security at the application layer: PGP and S/MIME	04
11	Security at the transport layer: SSL and TSL	04
12	E -Commerce Security	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1	**Introduction** Security Goals, Attacks, Services and Mechanisms, Techniques	**02 Hours**	**04%**
2.	**Mathematics of Cryptography** Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence	**03 Hours**	**06%**
3.	**Tradition Symmetric Key Ciphers** Introduction, Substitution Ciphers, Transposition Ciphers, Stream and block Ciphers	**03 Hours**	**07%**
4.	**Introduction to Modern Symmetric Key Ciphers** Modern Block Ciphers, Modern Stream Ciphers	**04 Hours**	**09%**
5.	**Data Encryption Standard** Introduction, DES Structure, DES Analysis, Multiple DES, Security of DES	**05 Hours**	**11%**
6.	**Advanced Encryption Standard** Introductions, Transformations, Key Expansions, Ciphers, Examples, Analysis of AES	**04 Hours**	**09%**
7.	**Mathematics of Cryptography** PRIMES, Preliminary Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Algorithm	**04 Hours**	**09%**
8.	**Asymmetric Key Cryptography** Introduction, RSA Cryptosystem, RABIN Cryptosystem, ELGAMAL Cryptosystem	**04 Hours**	**09%**
9.	**Key Management** Symmetric Key Distribution, Kerberos, Symmetric Key agreement, Public Key Distribution	**04 Hours**	**09%**
10.	**Security at the application layer: PGP and S/MIME** Email. PGP, S/MIME and Algorithm	**04 Hours**	**09%**
11	**Security at the transport layer: SSL and TSL**	**04 Hours**	**09%**

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SSL Architecture, FOUR Protocols, SSL Message Formats, Transport Layer Security

12 E-commerce Security 04 Hours 09%

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Electronic Voting / Polling systems -Standards and Applications

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:

After completing this course, students will be able to:

- Explain common attacks against network assets, the associated threats and vulnerabilities, and what network security personnel do to secure assets.
- Explain how to use cryptography to help protect information and how to choose an appropriate encryption method for an organization.
- Implement security-enhanced computing baselines in an organization.
- Help protect transmission of data by identifying threats to network devices and implementing security for common data transmission, remote access, and wireless network traffic.
- Identify common security threats and vulnerabilities to directory services and DNS, and then apply security methods to help protect them.
- Identify types of security policies to manage operational security, and then use these policies to ensure compliance by users in an organization.
- Preserve business continuity by implementing a security-enhanced disaster recovery strategy, communicating risks to others, and performing secure backup and recovery.

F. Recommended Study Material:

- **Text Books:**
  1. Behrouz A. Forouzan, “Cryptography and Network Security” , THM, ISBM: 978-0-07-066046-5
- **Reference Books:**
  1. Eric Cole, Ronald Krutz, “Network Security Bible”, Wiley ISBN:81-265-0576-1
  2. Vijay K Bhargava, “Communications, Information and network Security”, Kluwer Academics Publication;ISBN-1-4020-7251-1
  3. Bruce Scheneir: "Applied Cryptography", 2/E, John Wiley, 1996.
  4. Menezes, Oorschot, Vanstone: "Handbook of Applied Cryptography", CRC Press, 1996.
  5. D Stinson, "Cryptography: Theory and Practice", 2/E, Chapman & Hall, 2002
- **Web Materials:**
  1. http://www.interhack.net/pubs/network-security/

CE742: DATA MINIMG & BUSINESS INTELLIGENCE(PC-II)

Credits 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

- To understand the basics of data mining
- To understand the basics of data warehousing and business intelligence
- To understand the use of the various data mining tools.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Data Warehousing and Business Intelligence	05
2.	The Architecture of BI and DW	07
3.	Introduction to data mining (DM)	04
4.	Data Pre-processing	07
5.	Concept Description & Association Rule Mining	07
6.	Classification and Prediction	07
7.	Data Mining for Business Intelligence Applications	04
8.	Advance topics	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1. Overview and concepts Data Warehousing and Business Intelligence **05 Hours 12%**

Why reporting and Analysing data, Raw data to valuable information-Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data 1marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing.

2.	**The Architecture of BI and DW**	**07 Hours**	**16%**

BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations

3.	**Introduction to data mining (DM)**	**04 Hours**	**08%**

Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process

4.	**Data Pre-processing**	**07 Hours**	**16%**

Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.

5.	**Concept Description and Association Rule Mining**	**07 Hours**	**16%**

What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining

6.	**Classification and Prediction**	**07 Hours**	**16%**

What is classification and prediction? – Issues regarding Classification and prediction:

- Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network
- Prediction methods: Linear and nonlinear regression, Logistic Regression

Introduction of tools such as DB Miner /WEKA/DTREG DM Tools

7.	**Data Mining for Business Intelligence Applications**	**04 Hours**	**08%**

Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc.

8.	**Advance topics**	**04 Hours**	**08%**

Introduction and basic concepts of following topics.

Multirelational Data Mining, Clustering, Spatial mining, web mining, text mining, Ensemble Classifier (Multiple Classifier, Bagging, Boosting, Stacking), Incremental learning

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:

By taking this course,

- Students will be able to use mining tool.
- Students are able to perform various data warehouse related exercise.

F. Recommended Study Material:

- **Text Books:**
  1. J. Han, M. Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann
  2. M. Kantardzic, “Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
- **Reference Books:**
  1. Paulraj Ponnian, “Data Warehousing Fundamentals”, John Willey.
  2. M. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education.
  3. G. Shmueli, N.R. Patel, P.C. Bruce, “Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, Wiley India.

CE743: MOBILE COMPUTING & APPLICATION DEVELOPMENT(PC-III)

Credits and Hours:

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

A. Objective of the Course:

- To study the Fundamentals behind Mobile Computing
- To study the Integration of Mobile Computing Technology
- To study insight into Wireless Technology
- To study the Protocols related Mobile Network and Mobile Transport Layer

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Wireless transmission	02
2.	Telecommunication systems	04
3.	Medium access control	04
4.	Wireless LAN	10
5.	Mobile network layer	05
6.	Mobile transport layer	10
7.	Android Programming	10

Total hours (Theory): 45

Total hours (Lab): 60

Total hours: 105

C. Detailed Syllabus:

1 Wireless transmission **02 Hours 05%**

Frequencies for radio transmission , signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum , Cellular

	system		
2	**Telecommunication systems** GSM, Digital enhanced cordless telecommunications(DECT)	**04 Hours**	**09%**
3	**Medium access control** Wireless Medium Access control and CDMA- based communication – Medium access control, Introduction to CDMA-based systems, Spread spectrum in CDMA systems, coding methods in CDMA	**04 Hours**	**09%**
4	**Wireless LAN** Infra red vs radio transmission, infrastructure and ad hoc networks, IEEE 802.11, Bluetooth	**10 Hours**	**22%**
5	**Mobile network layer** Mobile IP, Dynamic host configuration protocol, Mobile ad-hoc networks, Wireless sensor networks	**05 Hours**	**11%**
6	**Mobile transport layer** Traditional TCP, Classical TCP improvements, snooping TCP, Mobile TCP, TCP over 2.5/3G wireless networks.	**10 Hours**	**22%**
7	**Android Programming** Architecture of Android, Android application life cycle, Activities, Fragments, Intent, Layout Design, View and View-group, Menu, Action Bar. Location Based Services, Publishing Android Application.	**10 Hours**	**22%**

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:

By taking this course Mobile computing and Wireless Networking

- Understand the basic concepts Mobile Computing.

- Integration of Existing technology for development of Mobile Computing.
- Student will be able to make program which works on Cellular phones

F. Recommended Study Material:

❖ **Text Books:**

1. "Mobile Communications" by John Schiller, Pearson Edition, ISBN:81-7808-170-9.
2. "Mobile Computing: Technology, Applications and Service Creation" by Asoke K Talukder and Roopa R Yavagal, TMH,ISBM: 0-07-058807-4
3. "Beginning Android 4 Application Development" Wei-Meng Lee, Wrox

❖ **Reference Books:**

1. "Any Time, Any Where Computing: Mobile Computing Concepts and Technology" by Richard Brice, Darrell Woelk, Kluwer Academic Publishers, ISBN:0-7923-8610-8

CE766: ADVANCED DATA STRUCTURES & ALGORITHMS (PE - I)

Credits and Hours:

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

A. Objective of the Course:

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

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Analysis of Algorithm	04
2	Randomized Algorithms	10
3	Graph Algorithms	08
4	String Matching	07
5	Approximation Algorithms	08
6	Computational Complexity	08

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1. Analysis of Algorithms **04 Hours 08%**

The efficiency of algorithm, average and worst case analysis,

	elementary operation. Asymptotic Notation, Analyzing control statement, Analyzing Algorithm using Barometer. Amortized analysis, solving recurrence Equation, Sorting Algorithm, Binary Tree Search.		
2.	**Randomized Algorithms** Probability, Analyzing Quick Sort. QuickSelect – median selection in linear time. QuickSort and Treaps with High Probability, Treaps.	**10 Hours**	**22%**
3.	**Graph Algorithms** Breadth First Search (BFS), Depth First Search (DFS). Topological Sort Strongly Connected Components, Euler Tour. Generic Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm, Single Source Shortest Path, Dijkstra's Algorithm, Bellman-Ford Algorithm.	**08 Hours**	**18%**
4.	**String Matching** Introduction, The naïve string matching algorithm. The Rabin-Karp algorithm, Knuth-Morris-Pratt Algorithm, Boyer-Moore Algorithm.	**07 Hours**	**16%**
5.	**Approximation Algorithms** Greedy algorithms and approximation algorithms, Travelling Salesman Person, Approximation Algorithms for Set Cover and Clustering.	**08 Hours**	**18%**
6.	**Computational Complexity** Introduction, Complexity classes, More NP-Complete problems Max-Clique, Independent Set, Vertex Cover, Graph Coloring, Hamiltonian Cycle and Travelling Salesman Problem	**08 Hours**	**18%**

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 exam will be conducted and 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:

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

- 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 analyse 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 : Prentice Hall of India
3. Algorithm Design by Kleinberg and Tardos, Low Priced Ed. by Pearson.

❖ **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, Sartaz sahni and sanguthevar Rajasekarm

❖ **Web Materials:**

1. http://www.cse.iitd.ernet.in/~naveen/courses/CSL630/sariel.pdf
2. http://www.cse.iitd.ernet.in/~naveen/courses/CSL630/jeff.pdf

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

Credits 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

Total hours (Lab): 30

Total hours: 75

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	**02 Hours**	**04%**
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	**04 Hours**	**08%**
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	**08 Hours**	**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	**06 Hours**	**14%**
7.	**Interprocess Communications** Universal IPC facilities, System V IPC, Mach IPC, Messages, Ports, Message passing, Port operations, Extensibility Mach 3.0 enhancements, discussion	**06 Hours**	**14%**
8.	**Case Study: Multiprocessor Systems, Distributed Unix Systems** overview, Solutions with master and slave processors, solutions with	**05 Hours**	**10%**

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 Outcomes:

- 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.

HS141.02A: LANGUAGES (FRENCH) (HSS ELECTIVE-I)

I. Credits and Schemes:

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
				Contact Hours/Week	Theory		Practical		Total
					Internal	External	Internal	External	
I	HS141.02A	LANGUAGES (French)	02	02	--	--	30	70	100

II. Course Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**Introduction to French Language** **Facts and figures about French Language** **Basic French Linguistics** * Alphabets * Accents * Liaison * Nasalization French Culture, Differ between French and English **Grammar :** • Subject Pronoun • Verbs : (être ,avoir, habiter,regarder,manger … "er" verb) • Form of address • Numbers (1 to 20) • Nouns and plurals of nouns • The expression : C'est ,Il y a **Presentation:** 1) Self Introduction 2) Question and answering **Dialogue**	**08**
2	**Grammar :** • Definite articles • Indefinite articles • Present tense o Positive Froms o Negative Forms • Numbers (21 to 100 , 100-1000) • Days ,Months ,Familly • Verbs: (aller,venir,finir,pouvoir,vouloir ….. "ir " verb)	**08**

	Social Links: 1) My family & relations 2) Appointments 3) Gathering information from someone **Dialogue**	
3	**Grammar :** • Common Adjectives • Comparative Adjectives • Common Adverbs • Interrogative Forms • The expression : "On" • Directions , Countries, Nationalities, Seasons, Weather, • Professions • Verbs: (Prendre, Apprendre, Comprendre, faire ... "re " verb) **Work , Study and Travel** 1) Job/ Profession 2) Ticket Reservation (At Bus/At Railway/At Airport) **Dialogue**	**08**
4	**Grammar :** 1) Common Prepositions 2) Common Conjunctions 3) Past Tense 4) Future Tense 5) Colors ,Shapes, Animals ,Vegetables, Fruits 6) Verbs: ("er", "ir","re" etc...) **Food & Shopping** 1) Buy a vegetables and fruits 2) Any Conversation between Customer and Vendor (At Mall/ At Restaurant / At Market) **Dialogue**	**06**
	Total	**30**

III. Instruction Methods and Pedagogy

The course is based on pragmatic learning. Teaching will be facilitated by Reading Material, Discussion, Task-based learning, assignments and various interpersonal activities like group/pair work, independent and collaborative work, presentations, etc.

IV. Evaluation:

The students will be evaluated continuously in the form of their consistent performance. 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.

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

Internal Evaluation:

Sl. No.	Component	Number	Marks per incident	Total Marks
1	Assignment / Presentation/ Task	5	5	25
2	Attendance and Class Participation			05
			Total	**30**

External Evaluation

The University Practical Examination will be for 70 marks and will test the LSRW skills in the French Language.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Term Work, Viva and Practical (LSRW)	-	70	70
			Total	**70**

Note: The reference/ reading material will be provided in consultation with the expert.

HS105.02 A: ACADEMIC SPEAKING AND PRESENTATION SKILLS (HSS ELECTIVE-I)

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	--	02	--	30	**02**
Marks	--	100	--	100	

Pre-requisite courses:

- Beginner/Intermediate level language proficiency

Objectives of the Course:

To facilitate the learners:

- to explore the concepts of advance communication
- to understand the concept of academic language
- to understand the concept and application of academic speaking
- to learn the nuances of formal/academic speaking
- to explore and implement accurate pronunciation, stress and intonation patterns in English
- to understand oral interactions, including impromptu speaking, job interviews, research presentations, and group discussion

Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Foundations of Advance Communication	04
2.	Art of Conversation	06
3.	Science of Power Speaking	06
4.	Academic Speaking Application – Part I	08
5.	Academic Speaking Application – Part II	06
	Total hours (Theory) :	**--**
	Total hours (Practical) :	**30**

Total hours : 30

Detailed Syllabus:

1.	Foundations of Advance Communication	04 Hours	14%
	Meaning and Definition of Advance Communication; Advance Communication in Digital, Social, Mobile World; Strategies for Advance Communication; Meaning and Concept of Academic Language; High Frequency Academic Vocabulary		
2.	Art of Conversation	06 Hours	20%
	Describing people, places and things; Expressing opinions; Making suggestions; Persuading someone; Interpreting and Summarizing		
3.	Science of Power Speaking	06 Hours	20%
	Phonemes, Word Stress, Pronunciation, Intonation, Pause, Register, Fluency, Prosody, Lexical Range		
4.	Academic Speaking Application – Part I	08 Hours	26%
	Art of Oratory, Formal Presentation, Speech Analysis – Decoding Best Speeches		
5.	Academic Speaking Application – Part II	06 Hours	20%
	Job Interview, Group Discussion, Meeting		

Recommended Study Material:

- **Reference book:**
  1. *Business Communication Today* (Thirteenth Edition) by Courtland L. Bovee, John V. Thill and Roshan Lal Raina
  2. *Effective Speaking Skills* by Terry O' Brien
  3. *Speak Better Write Better* by Norman Lewis
  4. *Well Spoken: Teaching Speaking to All Students* by Erik Palmer
  5. *Let Us Hear Them Speak : Developing Speaking – Listening Skills in English* by Jayshree Mohanraj (Publisher – Sage Publication)
  6. *The craft of scientific presentations: Critical steps to succeed and critical errors to avoid*. New York: Springer by Michael Alley
  7. *Presentation Skills in English* by Bob Dignen (Publisher: Orient Black Swan)

❖ **Web material:**

1. TED Talk : How to speak so that people want to listen
   https://www.ted.com/talks/julian_treasure_how_to_speak_so_that_people_want_to_listen?language=en
2. TED Talk: The 110 techniques of communication and public speaking
   https://www.ted.com/talks/david_jp_phillips_the_110_techniques_of_communication_and_public_speaking

M. Tech. (Computer Engineering) Programme

SYLLABI

(Semester – 2)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CE744: INTERNET OF THINGS(PC-I)

Credits 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 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 Analytics	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 Outcomes:

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 Books:**

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

CE745: INTELLIGENT NETWORKS(PC-II)

Credits and Hours:

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

A. Objective of the Course:

The main objective to give the course

- To understand uses of intelligent scenario of routing protocols.
- To learn current research area in to Intelligent Network
- To utilize the concepts of Intelligent Network to develop future applications.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Layering Model and Physical Interface	07
2	Internetworking Routing	10
3	Transport and Application Services	10
4	Software Defined Networking	05
5	Named Data Network	13

Total hours (Theory): 45

Total hours (Lab): 60

Total hours: 105

C. Detailed Syllabus:

1. Layering Model and Physical Interface **07 Hours 16%**

Protocols and Standards, Standards Organization, Internet Standards, Internet Administration, A Brief History, The OSI Model, Layers in the OSI Model, TCP/IP Protocol suite, Addressing, TCP/IP versions. Local Area Networks (LAN),

Point-to-Point WAN, Switched WAN, Connecting Devices, Addressing Mapping, The ARP Protocol, and Messages.

2.	**Internetworking Routing** Switching, Network Layer Services, Input Ports, Switching Fabric, Output Ports, Where does queuing Occur, Datagram Format, IPv4 Addressing, IPv6, Link State Routing Algorithm, Distance Vector Routing Algorithm, Hierarchical Routing, RIP, OSPF, BGP, Broadcast Routing Algorithms, Multicast.	**10 Hours**	**22%**
3.	**Transport and Application Services** User Datagram, UDP Services, UDP Packages, Process-to-Process Communication, TCP Services, Segment, Options, Checksum, Flow Control, Error Control, TCP Timers, Connection, State Transition Diagram, Congestion Control, TCP Operation, TCP Design, Introduction, DHCP operations.	**10 Hours**	**22%**
4.	**Software Defined Networking** History and evolution of SDN, Control and Data Plane of SDN, Network Virtualization, Network Function Virtualization	**05 Hours**	**11%**
5.	**Named Data Network** Introduction to NDN, CDN,CCN,SDN, Named Data Networking, Routing in NDN, Instant Messaging, Interest Forwarding, Performance Measurement of Name-Centric Content Distribution Methods	**13 Hours**	**29%**

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.
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Minimum 5 experiments shall be there in the laboratory related to course contents.
- Research / technical papers in relevant areas must be covered.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.

- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

E. Student Learning Outcomes:

By taking this course,

- To understand, design and implement Routing Protocol.
- Student will learn how congestion control can be applied to future network
- Students will know various addressing standards of internet
- Students will know various routing algorithm

F. Recommended Study Material:

❖ **Text Books:**

1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach.", Fifth Edition; Pearson, ISBN: 978-81-317-9050-0
2. Behrouz A. Forouzan, "TCP/IP Protocol Suite.", Fourth Reprint, 2003;Tata McGraw Hill ISBN: 0-07-049551-3

❖ **Reference Books:**

1. Douglas E. Comer and David L. Stevens, "Internetworking with TCP/IP Volume-2, Design, Implementation and Internals ", Prentice Hall
2. Douglas E Comer, "Computer Network and internet with internet applications", 4th edition, Pearson Education, ISBN: 81-297-0330-0
3. Karanjit S. Siyan, "Inside TCP/IP", third edition, New Riders Publishing , ISBN: 1-56205-714-6
4. Karanjit S. Siyan, "TCP/IP Unleashed", third edition, Pearson Education, ISBN: 81-7808-758-8
5. Garj R. Wright, W Richard. Stevens, "TCP/IP Illustrated, Volume-2, The Implementation", 2000, Pearson Education
6. Miller, "Data Networking and Communication", Vikas Publishing house, ISBN: 981-240-058-3

❖ **Web Materials:**

1. https://www.coursera.org/course/sdn1

CE746: CLOUD COMPUTING(PC-III)

Credits 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** Type of Virtualization, Virtualization Technologies, Virtualize your Environment, Managing Virtualization Environment, Storage Virtualization.	**02 Hours**	**05%**
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	**13 Hours**	**28%**

Balanced Virtual Switches Architecture, Multipath Resource Access Architecture, Persistent Virtual Network Configuration Architecture, Redundant Physical Connection for Virtual Servers Architecture, Storage Maintenance Window Architecture

7. Build Cloud Application using Cloudstack. 04 Hours 10%

Apache CloudStack Architecture, Apache CloudStack Configuration.

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 Computing for 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

CE765: MACHINE LEARNING (PE - II)

Credits and Hours:

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

A. Objective of the Course:

The intent of this course is to present a broad introduction to Machine Learning, the study of computing systems that improve their performance with experience; including discussions of each of the major approaches. The primary focus of the course will be on understanding the underlying algorithms used in various learning systems.

At the end of the course the student will understand:

- Concept Learning and the General-to-Specific Ordering
- Decision Tree Learning
- Artificial Neural Networks
- Bayesian Learning
- Computational Learning Theory
- Instance-Based Learning
- Unsupervised learning

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction	02
2	Inductive Classification	04
3	Ensemble Learning	05
4	Experimental Evaluation of Learning Algorithms	04
5	Computational Learning Theory	05
6	Rule Learning: Propositional and First-Order	05
7	Artificial Neural Networks	04
8	Support Vector Machines	04
9	Bayesian Learning	02
10	Instance-Based Learning	02

11	Introduction to G A, N N and Fuzzy logic	04
12	Hybrid System	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1 Introduction **02 Hours 07%**

Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.

2 Inductive Classification **04 Hours 09%**

The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypotheses. Finding maximally specific hypotheses. Version spaces and the candidate elimination algorithm. Learning conjunctive concepts. The importance of inductive bias

3 Ensemble Learning **05 Hours 11%**

Using committees of multiple hypotheses. Bagging, boosting, and DECORATE. Active learning with ensembles.

4 Experimental Evaluation of Learning Algorithms **04 Hours 09%**

Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

5 Computational Learning Theory **05 Hours 11%**

Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity: quantifying the number of examples needed to PAC learn. Computational complexity of training. Sample complexity for finite hypothesis spaces. PAC results for learning conjunctions, kDNF, and kCNF. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.

6	**Rule Learning: Propositional and First-Order** Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction (Inductive Logic Programming) and Foil. Learning recursive rules. Inverse resolution, Golem, and Progol.	**05 Hours**	**11%**
7	**Artificial Neural Networks** Neurons and biological motivation. Linear threshold units. Perceptions: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Over fitting, learning network structure, recurrent networks.	**04 Hours**	**09%**
8	**Support Vector Machines** Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators. Kernels for learning non-linear functions.	**04 Hours**	**09%**
9	**Bayesian Learning** Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies.	**02 Hours**	**04%**
10	**Instance-Based Learning** Constructing explicit generalizations versus comparing to past specific examples. K-Nearest-neighbor algorithm. Case-based learning.	**02 Hours**	**04%**
11	**Introduction to G A, N N and Fuzzy logic** Introduction to Genetic Algorithms - Definition of GA - Description of Terminology/Vocabulary of GA - Importance and Goal of Traditional Optimization Methods - Classification of Search Techniques - Introduction to Hill climbing - Simulated annealing – Decision Tree - Difference between Genetic Algorithms and Traditional Methods - Fuzzy logic - Introduction – Definition and Terminology - Set	**04 Hours**	**09%**

Theoretic Operations-MF Formulation and Parameterization-Extension Principal and Fuzzy Relations-Fuzzy Rules-Fuzzy Reasoning - Mamdani Fuzzy Model, Neural Network- Basic Concept of Neural Network - Human Brain, Model of An Artificial Neuron-Neural Network Architecture - Characteristic of Neural Network

12 Hybrid Systems **04 Hours 07%**

Introduction to Hybrid System – Types of Hybrid Systems – Neuro Fuzzy Hybrids – Neuro Genetic Hybrid – Fuzzy Genetic Hybrids – Neuro Fuzzy Modelling – Application.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Minimum 5 experiments shall be there in the laboratory related to course contents.
- Research / technical papers in relevant areas must be covered.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

E. Student Learning Outcomes:

- Student will know how prediction from data can do.
- The course introduces an approach to thinking about machine learning.
- The students will be able to describe why a particular model is appropriate in a given situations, formulate the model and use it appropriately

F. Recommended Study Material:

❖ **Text Books:**

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997. ISBN 0070428077
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004

❖ **Reference Books:**

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Richard O. Duda, Peter E. Hart & David G. Stork, "Pattern Classification. Second Edition", Wiley & Sons, 2001.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The elements of statistical learning", Springer, 2001.
4. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", MIT Press, 1998.

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

Credits and 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): 45

Total hours (Lab): 30

Total hours: 75

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 **05 Hours** **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** Defining Quality Requirements, Complexity Metrics and models, Project Tracking and Oversight, Data Quality Control, Software Inspection, Reliability Models, Reliability Growth Models	**06 Hours**	**13 %**
6.	**Software Testing and Maintenance** 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	**08 Hours**	**17 %**
7.	**Software** Testing Tools Test case Generation Methodology, Study of various Testing Tools (Win Runner, Load Runner), Automatic Testing Tool.	**04 Hours**	**12 %**

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 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

HS106.02 A: ACADEMIC WRITING

I. Credits and Schemes:

Sem	Course Code	Course Name	Credits	Teaching Scheme	Evaluation Scheme				
				Contact Hours/Week	Theory		Practical		Total
					Internal	External	Internal	External	
II	HS106.02A	Academic Writing	02	02	--	--	30	70	100

II. Course Objectives

To facilitate learners to:

- explore and demonstrate professional communication skills
- understand the concept and applications of academic writing
- learn the academic writing style, strategy and approach
- explore and implement accurate and effective writing in English in academic setting
- hone their academic writing skills in general

III. Course Outline

Module No.	Title / Topic	Classroom Contact Hours
1	**Academic Writing and Research Process** • *Introduction to Academic Writing* • *Academic Writing as a Part of Research* • *Types of Academic Writing* • *Features of Academic Writing* • *Importance of Good Academic Writing in various Academic Works*	**05**
2	**Anatomy of Academic Writing** • *Academic Vocabulary* • *Simple and Complex Sentences* • *Organizing Paragraphs* • *The Writing Process* • *Adopting Academic Writing Style*	**05**
3	**Key Academic Skills** • Note – taking • Note – making • Paraphrasing • Summarizing	**05**
4	**Accuracy in Academic Writing** • *Lexical Range* • *Academic Language and Structures* • *Elements of Writing*	**05**

	• *Proof Reading, Editing, and Rewriting*	
5	**Using and Citing Sources of Ideas** • *Academic Texts and their Types* • *Intellectual Honesty in Academic Writing* • *Avoiding Plagiarism – Idea Theft* • *Degrees of Plagiarism* • *Types of Borrowing* • *Anatomy of Citations* • *Common Citation Styles*	**05**
6	**Contemporary Practices in Academic Writing** • Analytical Essays • Graph / Table / Process Interpretation and Description • Writing Reports • Writing Research / Concept Papers	**05**
Total		**30**

IV. 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 writing, group work, independent and collaborative research, etc.

V. 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	Paragraph Writing	1	3	03
2	Note-taking / Note-making	1	3	03
3	Paraphrasing / Summarizing	1	4	04
4	Essay Writing	1	5	05
5	Concept Paper Writing	1	10	10
5	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 skills of the students.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Viva / Practical /Quiz/ Project / Academic Writing	-	70	70

Total	**70**

VI. Learning Outcomes

At the end of the course, learners:

- will have sound understanding of the concept and applications of academic writing
- will have acquired enough knowledge of academic writing style, strategy and approach
- will be able to demonstrate error free and effective academic writing
- will be able to demonstrate ability to work on project/report/paper writing

VII. Reference Books / Reading

Essential Reading for Concepts

- Academic Writing for International Students, Routledge
- Academic Writing: A Guide for Management Students and Researchers. Monipally, M. M. & Pawar, B. S. Sage. 2010. New Delhi

Essential Reading for Activity and Teacher Resource

- ***Effective Academic Writing Level - 1,2,3,4 (Second Edition) By:*** Alice Savage, Patricia Mayer, Masoud Shafiei, Rhonda Liss, & Jason Davis; *Publisher: Oxford*

Additional Reading

- Writing Your Thesis (2nd Edition) by Paul Oliver, Sage
- Development Communication In Practice by Vilanilam V J, Sage
- Intercultural Communication by Mingsheng Li, Patel Fay, Sage
- www.owl.perdue.edu

M. Tech. (Computer Engineering) Programme

SYLLABI

(Semester – 3)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CE811: PROJECT PRELIMINARIES

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	0	4	4
Marks	100	100	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 Hours 10 %**

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

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

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

3 Matrix Algebra **06 Hours 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 Hours 05 %**

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 Hours 05 %**

	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** 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-	**03 Hours**	**05 %**
7	**Sampling Design** 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	**03 Hours**	**05 %**
8	**Measurement and Scaling Techniques** 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-	**03 Hours**	**05 %**
9	**Methods and Data Collection** 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	**03 Hours**	**05 %**
10	**Processing and Analysis of Data** Processing Operations-Some Problems in Processing-Elements/Types of Analysis-Statistics in Research-Measures of Central Tendency-Measures of Dispersion-Measures of	**03 Hours**	**05 %**

Asymmetry (Skewness)-Measures of Relationship-Simple Regression Analysis-Multiple Correlation and Regression-Partial Correlation-Association in Case of Attributes

11 Sampling Fundamentals **03 Hours** **05 %**

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 Hours** **05 %**

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 Hours** **05 %**

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** 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-	**03 Hours**	**05 %**
15	**Testing of Hypotheses – II (Nonparametric or Distribution – free Tests)** Important Nonparametric or Distribution-free Test-Relationship between Spearman'sr's and Kendall's W - Characteristics of Distribution-free or Non-parametric Tests	**03 Hours**	**05 %**
16	**Multivariate Analysis Techniques** 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	**03 Hours**	**05 %**
17	**Interpretation and Report Writing** 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	**03 Hours**	**05 %**

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

CE812: PROJECT PHASE - I

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	-	36	36	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. (Computer Engineering) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CE815: PROJECT PHASE - II

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	-	36	18	18
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 defence' 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.