MANAV RACHNA UNIVERSITY
FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING
NAAC ACCREDITED 'A' GRADE INSTITUTION
Declared as State Private University under section 2f of the UGC act, 1956

MANAV RACHNA UNIVERSITY

Established, vide Haryana Act no.26 of 2014
(Formerly ManavRachna College of Engineering,
NAAC Accredited 'A' Grade Institute)

Faculty of Engineering

Department of Computer Science & Technology

Syllabus

For

MTech – Computer Engineering

CSP01 B SCHEME

MANAV RACHNA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE&TECHNOLOGY
SYLLABUS & SCHEME

TOTAL CREDITS FOR SEMESTER I – IV

S.No.	Semester	Credits
1	I	19.5
2	II	20.5
3	III	16
4	IV	16
	Total Credits M.Tech Program	72

CSP01- Semester-I

COURSE CODE	COURSE NAME	Course Type	Course Nature	PERIODS				CREDITS
		Core(Departmental/Allied)/ Elective (Departmental/ Open) / University Compulsory	Hard/Soft/ Workshop/ NTCC	L	T	P	O	
CSH501B T & P	Advanced Algorithms	Domain Core	Hard	3	0	2	0	4
CSH502B T & P	Mathematical Foundation Of Computer Science	Domain Core	Hard	3	0	2	0	4
CSH503B T & P	Soft computing & fuzzy logic	Domain Elective	Hard	3	0	2	0	4
CSH504B T & P	Advanced wireless & mobile networks	Domain Elective	Hard	3	0	2	0	
CSH505B T &P	No sql database models	Domain Elective	Hard	3	0	2	0	
CSS506B	Research Methodology & Ipr	Domain Core	Soft	1	0	2	0	2
CSW507B/ CSW508B	Python programming / R programming	Domain Elective	Workshop	0	0	4	0	2
CSW509B	Agile technologies	Domain Core	Workshop	0	0	3	0	1.5
CSS510B	Pedagogical skills	Audit	Soft	2	0	0	0	2

Course Title/ Code	Advanced Algorithms(CSH501B)
Course Type	Core
Course Nature	Hard

L-T-P-O Structure	(3-0-2-0)
Objectives	Students will be able to understand the properties and efficiency of algorithms as a function of its input size in terms of both time and memory.

Section-A

Introductory Concepts: Introduction to Algorithms, Time and Space Complexity, Solving recurrence equations. Design Paradigms Overview: Overview of Iterative, Divide and Conquer, Greedy and Dynamic Programming strategies.

Section-B

String Matching and Radomized Algorithms: Introduction to string-matching problem, Naïve algorithm, Rabin Karp, Knuth Morris Pratt, Boyer-Moore algorithms and complexity analysis. Random numbers, randomized quick sort, randomly built binary search tree.
Graph Algorithms: Basic search and traversal techniques for graphs, Backtracking, Branch and Bound.

Section-C

Parallel and Max Flow Algorithms: Introduction to parallelism, PRAM models,.speedup and efficiency, some PRAM algorithms and their parallel time and processors complexity., merging and sorting, handling writing conflicts,finding connected components, Min-Cut Max-Flow algorithms.

Section-D

Complexity Theory and Approximation Algorithms:P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; Introduction to approximation,absolute approximation, e-approximation, Combinatorial Optimization, approximation factor, Polynomial time approximation schemes(PTAS), fully polynomial time approximation schemes (FPTAS), Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis ofthe expected time complexity of the algorithms.

List of Experiments

1. To implement divide and conquer technique on a suitable problem.
2. To implement knapsack problem using Greedy and dynamic approach.
3. To implement knapsack problem using branch and bound technique.
4. To implement Rabin Karp string matching algorithm.
5. To implement KMP string matching algorithm.
6. To implement randomized quick Sort algorithm.
7. To find connected components in a graph.
8. To implement Max Flow algorithm.
9. To implement Vertex Cover problem using approximation algorithm.
10. To implement TSP problem using approximation algorithm.

Text Books:

1. Introduction to Algorithms: T.H. Cormen, C.E.Leiserson and R.L. Rivest
2. Fundamentals of Algorithmics:G.Brassard and P.Bratley

Reference Book:

1. Approximation Algorithms: Vijay V.Vazirani

2. Randomized Algorithms: R. Motwani and P.Raghavan
3. Reference book: Algorithmics:The spirit of computing: D.Harel
4. Fundamental of Computer algorithms, Ellis Horowitz and SartajSahni, 1978, Galgotia Publ.

Course Title/ Code	Mathematical Foundation in Computer Science (CSH502B)
Course Type	Core
Course Nature	Hard
L-T-P-O Structure	(3-0-2-0)
Objectives	The student will understand concepts in theoretical computer science and their interconnection.

Section-A

Mathematical notions and Terminology of sets,function, relation, logic.
Finite Automaton: - Finite State Systems, Representation of finite automaton, NDFA, DFA, Equivalence of DFA and NDFA. Removals of ε – moves from finite automata's, Minimization of finite Automata. Moore and mealy Machines, Properties and limitations of FSM,
Regular Expressions: - basic operation of regular expression, Equivalence of finite automata and Regular Expressions, Arden's Method. The Pumping Lemma for Regular Sets.

Section-B

Context free grammar: - Basic concept of CFG: tuples, production rules, derivation, parse tree, Ambiguity, left recursion, left factoring. Equivalence of CFL and CFG, Reduced forms, Removal of useless Symbols and unit production. Chomsky Normal Form (CNF), Griebach Normal Form (GNF). Pumping lemma for CFL.
Pushdown Automata: - stack, input tape, R/W head. NDPDA, DPDA, Representation of PDA, Equivalence of PDA and Context free Grammar, acceptability of string. Application of Pushdown Machines.

Section-C

Recursively Enumerable Grammar: - Basic concept of REG and REL, context senstivegrammar.Equivalence of REL and REG.
Turing Machines:- Basic concept of TM: tuples, transition function, Deterministic and Non-Deterministic Turing Machines, universal turing machine, Design of T.M. Halting problem of T.M., computing with turing machines. Chomsky hierarchy.

Section-D

Decidability:-Decidable problems concerning to CFL.The halting problems: Diagonalization method
Reducibility: -Undecidable problems from language theory.Post Correspondence Problem
Computability: - Primitive Recursive Functions.

List of Experiments

1. Regular expression
2. Finite Automaton
3. Identify and remove Left Recursion
4. Pushdown Automaton Lexical Analyzer

5. First and Follow
6. Turing machines
7. Decidability

Text Books:

1. The Theory of Computer Science (Automata, Language and Computation), K.L.P. Mishra, 2nd Edition, Prentice Hall Of India, 2001.
2. Introduction to Automata Theory, Languages and Computation, - J.E. Hopcroft, and J.D. Ullman, 2 nd Edition, Pearson Education

Reference Books:

1. An Introduction to Formal Languages And Automata, - Peter Linz, Narosa Publishing House, 2007.
2. Introduction to Languages and the Theory of Computation, - John C. Martin, 3rd edition, McGraw-Hill Inc, New York, 2003.

Course Title/ Code	**Soft Computing and Fuzzy Logic (CSH503B)**
Course Type	**Elective**
Course Nature	**Hard**
L-T-P-O Structure	(3-0-2-0)
Objectives	To introduce soft computing concepts and techniques and faster their abilities in designing appropriate technique for a given scenario.

Section-A

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing, Basics of Fuzzy Logic Theory, Crisp and Fuzzy Sets, Basic Set Operations, Fuzzy Relations, properties of membership functions, types of membership functions: triangular, trapezoidal, Gaussian, Composition of Fuzzy Relations, Mathematical Similarities between Neural Networks and Fuzzy Logic Models, Extension Principle, Membership Function Formulation and Parameterization, Fuzzy Reasoning.

Section-B

Fuzzy Inference Systems: Zadeh's Compositional Rule of Inference, linguistic values, linguistic variables, fuzzy rules, fuzzy inference, fuzzy inference systems, fuzzification, defuzzification, Mamdani, Sugeno, Tsukamoto Fuzzy Models.

Section-C

Neuro Fuzzy Modeling: Neuro-Fuzzy Computing, Neuro-Fuzzy Inference Systems, Adaptive Neuro-Fuzzy Inference Systems: Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN, Coactive Neuro-Fuzzy Inference Systems (CANFIS).

Section-D

Applications of Soft Computing: Printed Character Recognition, Color Recipe Prediction, Applications in Bioinformatics,Neuro-FuzzyControl,SpeechRecognition.

List of Experiments

1. Given the following fuzzy set:
A = 0.5/3 + 0.3/6 + 0.1/8 + 1/10
Find A complement.

2. Given the following fuzzy sets:
A = 0.5/3 + 0.3/6 + 0.1/8 + 1/10
B = 0.7/2 + 0.4/6 + 0.8/10
Find A intersection B.

3. Given the following fuzzy sets:
A = 0.2/3 + 0.4/7 + 0.8/21 + 1/27
B = 0.4/7 + 0.5/34 + 0.9/27
C = 0.3/3 + 0.5/7 + 1/38
Find
   a) A ∪ B ∩ C
   b) A ∩ B ∩ C

4. Write programs in MATLab for implementing the following:
   a. A complement
   b. B complement
   c. C complement
   d. A intersection B
   e. A intersection C
   f. B intersection C
   g. A intersection B intersection C
   h. A union B
   i. A union C
   j. B union C
   k. A union B union C

5. Verify the following for the union operation:
   a. Commutative Law for the sets A and B
   b. Associative Law for the sets A, B and C

6. Consider the following fuzzy sets:

   A = 1/2 + 0.4/3 + 0.6/4 + 0.3/5
   B = 0.3/2 + 0.2/3 + 0.6/4 + 0.5/5
   C = 0.5/2 + 0.25/3 + 0.9/4 + 1/5

   Calculate the following by writing a MATLAB program.

   a. A ∪ B,
   b. A ∩ B,
   c. A ∩ (B ∪ C),
   d. A ∪ (B ∩ C),

7. Write MATLab programs to verify the following fuzzy set properties:
   a. Distributive Law
   b. Idempotency Law

c. Identity Law
d. DeMorgan's Law
e. Involution Law

8. Assume the following universes: X = {x1, x2}, Y = {y1, y2}, and Z = {z1, z2 , z3}, with the following fuzzy relations:

	Y1	Y2
X1	0.7	0.5
X2	0.8	0.4

	Z1	Z2	Z3
Y1	0.9	0.6	0.2
Y2	0.1	0.7	0.5

Find the fuzzy relation between X and Y, and Y and Z, using the max-min and max-product composition.

9. Use the built-in GUI tool for a Fuzzy Inference System to check whether the day is sunny, partially sunny, partially cloudy, or cloudy.
10. Use the built-in GUI tool for an ANFIS to check whether a given object is a triangle or a square or a rectangle.

Text Books:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education
2. Fakhreddine O. Karray, Clarence De Silva, "Soft Computing and Intelligent Systems: Theory, Tools and Applications," Pearson Education, 2009

Reference Books:

1. "Fuzzy Sets and Fuzzy Logic: Theory and Applications", by George J. Klir and Bo Yuan, 1995, Prentice Hall

Course Title/ Code	**Advanced wireless & mobile networks (CSH504B)**
Course Type	**Elective**
Course Nature	**Hard**
L-T-P-O Structure	(3-0-2-0)
Objectives	The students should get familiar with the wireless/mobile market and the future needs and challenges.

Section-A

INTRODUCTION: Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc. WIRELESS LOCAL AREA NETWORKS: IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF)

IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues

Section-B

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

Section-C

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview WIRELESS SENSOR NETWORKS Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

Section-D

WIRELESS PANs Bluetooth AND Zigbee, Introduction to Wireless Sensors,. SECURITY Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication. ADVANCED TOPICS IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

Reference Books:

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

Course Title/ Code	**NoSQL Database Model(CSH505B)**
Course Type	**Elective**
Course Nature	**Hard**
L-T-P-O Structure	(3-0-2-0)
Objectives	Students will be able to create, design & construct database using NoSQL Database (Graph database).

Section-A

Introduction: Defining NoSQL, What and Why NoSQL? Relational Database (persistent data, concurrency, integration), Application & Integration databases, cluster attack.NoSQL storage types,Aggregate Data Model: (example, consequences), key-value and document data model, and column-family model, Neo4j- key concepts and characteristics, Neo4j installation process.

Section-B

Data Models: Relationships, Graph & Schema-less Databases, Materialized Views, Modeling for Data Access. **Distribution Models:** (Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication).
Consistency: Update, Read, Relaxing Consistency, CAP Theorem, Relaxing Durability,Quorums.
Version Stamps: Business and System Transactions, Version Stamps on Multiple Nodes, Modeling data for Neo4j, Designing Graph databases on Neo4j.

Section-C

Map-Reduce: Basic, Partitioning & Combining, Composing Map-Reduce Calculations (Two Stage & Incremental Map-Reduce). **Key-Value Databases:** features (consistency, transactions, query, structure of data, scaling), Use cases, issue with key-value stores. Importing data into Neo4j, importing small(ish) datasets using Neo4j-shell-tools.

Section-D

Document Databases: introduction, features, use cases (event logging, content management systems, blogging platforms, web analytics or real-time analytics, e-commerce), problem in document databases.
Column-Family Stores: basic, features, use cases (event logging, counters, blog, content management), issues in column family.
Graph Databases: basics, features, use cases (connected data, routing, dispatch & location based services, engines), problem with graph database.
Visualizations for Neo4j- open source visualization libraries. Other tools related to Neo4j- data integration tools and business intelligence tools.

List of Experiments

1. Create nodes of graph.
2. Create relationships between nodes.
3. Update the nodes and relationships.
4. Queries to fetch the data from the graph created.
5. Queries using the general clause.
6. Queries using the reading clause.
7. Queries using the Writing clause.
8. Queries using the Functions.

Text Books:

1. Pramod J. Sadalage, Marting Fowler: NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Addison-Wesley 2012 ISBN: 0321826620 (PS).
2. GauravVaish: Getting Started with NoSQL. PACKT Publishing, ISBN 978-1-84969-4-988.
3. Eric Redmond; Jim R. Wilson. Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement. Pragmatic Bookshelf. 2012. ISBN: 1934356921 (ER).
4. Graph Databases by Dr. Jim Webber.

Reference Books:

1. Practical Neo4j - by Gregory Jordan

Course Title/ Code	Research methodology & IPR (CSW506B)
Course Type	Core
Course Nature	Soft
L-T-P-O Structure	(1-0-2-0)
Objectives	• Understand research problem formulation. • Analyze research related information • Follow research ethics

Section-A

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Section-B

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Section-C

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Section-D

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References Books

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

Course Title/ Code	**Python programming (CSW507B)**
Course Type	**Elective**
Course Nature	**Workshop**
L-T-P-O Structure	(0-0-4-0)
Objectives	The course is designed to provide Basic knowledge of **Python**. **Python** programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the **Python** programming language.

Section A

Introduction: Introducing the Python language, Understanding the Python shell, writing a simple program, Development environment setup, Configuring – Eclipse, interpreter, Introducing the Eclipse working environment, Concept of module and packages,

Basic Operators – Arithmetic, Relational, Assignment, Logical, Membership and Identity operators, Variables and Data Types, Understanding Mutable and Immutable types, Working with various type – None, Boolean(True/False), Numeric(int, float, long), Sequence(String, List & Tuple), Mapping(Dictionary) Understanding the concept of header & suites in the language construct, Conditionals and inline syntax, Multiple assignments in variables, Working with data type conversion, Working with Loops – While & For Effects of break, continue, pass & else statement in various construct,

Section-B

Implementing custom functions, Variable scope – Global vs. Local, Dealing with various function arguments – default, named and variable length arguments, Understanding the concept of pass by value and pass by reference, Returning multiple values from a function, Anonymous & Recursive function,

Understanding Strings in Python & different type of its delimiter, Working with special string operators & formatted strings, Exploring some useful built in string methods, Working with Date & Time,

Section-C

Understanding File Operations, Working with the File Object for reading & writing,Object oriented programming in Python,Understanding Classes & Objects, and Exploring different components of a Class**, Class** inheritance & Method overriding, Working with multiple Inheritance, Understanding the Abstraction mechanism in Python, Built-in Class attributes, Exception handling,

Section-D

Python DB Interaction. Python Demonstration: Reading and Writing CSV files,The Series Data Structure, Querying a Series, The DataFrame Data Structure, DataFrame Indexing and Loading, Querying a Data Frame, Indexing Data frames, Missing Values.

LIST OF EXPERIMENTS: Tool Used: - Eclipse Java Oxygen

1. Using Eclipse IDE to create and execute Python Program.
2. Programming Constructs in Python – Hands- on - Practice
3. Control Structure - Hands- on - Practice
4. String &List : Hands- on - Practice
5. Operation on Tuples : Hands- on - Practice
6. Mapping(Dictionary) : Hands- on - Practice
7. Function – Pass by reference : Hands- on - Practice
8. Working with the File Object for reading & writing
9. UML,Object Oriented Programming
10. Class inheritance & Method overriding: Hands- on – Practice
11. Exception handling : Hands- on - Practice
12. Python DB Integration

Text Books:

1. Dave Kuhlman, "A Python Book: Beginning Python, Advanced Python, and Python Exercises", December 2013.
2. Mark Lutz's, "Learning Python", O'Reilly, 2001

Reference Books:

1. Sahana Kumaraswamy, Roy Antony Arnoid G, "Assignment for Object Oriented Programming using Python ", Infosys, Dec 2015.
2. Lutz, Mark, and Mark Lutz. Programming python. Vol. 8. O'Reilly, 1996.
3. Sommerville, "Software Engineering", Addison Wesley, 1999.

Course Title/ Code	**R Programming (CSW508B)**
Course Type	**Elective**
Course Nature	**Workshop**
L-T-P-O Structure	(0-0-4-0)
Objectives	To introduce the practical applications of agile software development tools.

Section-A

Introduction to R, Understand the use of 'R' in the industry, Compare R with other software in analytics, Install R and the packages useful for Business Analytics,Using the R console, Getting help, Learning about the environment, Saving your work. R Vectors, Data Frames

Section-B

Variables: Variables and Assignment, Decision Making, Loops in R, Classes & Objects in R, Reading CSV, Excel and Text files. Writing and saving data objects to file, the various steps involved in Data Cleaning, Functions used in Data Inspection.

Section-C

Tackling the problems faced during Data Cleaning, Uses of the functions like grepl(), grep(), sub(),Packages installation used for database import, Connect to RDBMS from R using ODBC and basic SQL queries in R.

Section-D

Understanding Data Visualization, Graphical functions present in R, Plot various graphs like tableplot, Scatter Plot, Histogram, Box plot,Line graph,Bar charts,Pie charts. Customizing Graphical Parameters to improvise the plots, R Mean, Median, Mode, Linear Regression, Logistic Regression, Poission Regression, Normal Distribution and Binomial Distribution.Time Series Analysis, Decision Tree, Random Forest, Dimensionality reduction of Data: PCA, SVD, Predictive Analysis. Time series Decomposition, Time series clustering and classification.

Course Title/ Code	**Agile Technologies (CSW509B)**
Course Type	**Core**
Course Nature	**Workshop**
L-T-P-O Structure	(0-0-3-0)
Objectives	To introduce the practical applications of agile software development tools.

Section-A

Agile Programming Tools: UNIX, Eclipse, Git, jUnit,
Processes: Stories, End-to-end Testing, Unit Testing, TDD, Refactoring
Reading: Scrum, Extreme Programming, Features Driven Development, Lean Software Development

Section-B

Agile Architecture/Design and Continuous Integration Tools: Jenkins, Maven, Cucumber
Processes: Scrum, Architecture, Iterative Refinement, Agile Design.

Section-C

Agile DesignTools: Use Cases, PowerPoint Design, Requirements/Story Extraction, Test Case Management
Processes: Use cases to Design, Design to Backlog, Backlog to Tasks, End to End Testing, Estimation

Section-D

Agile Process ManagementTools: Agilefant
Processes: Agile Process Management, Estimation, Burn-down, Release Planning, Multi-team coordination, Distributed teams

List of Experiments

1. Test Driven Development on Eclipse using jUnit
2. Software Configuration Management using Git
3. Backlog development from use cases and user interface designs using Specification by Example
4. End-to-end/Acceptance tests using Cucumber

5. Continuous Integration using Jenkins
6. Agile Process Management using Agilefant.

Text Books:

1. Robert C. Martin, Clean Code: A Handbook of Agile Software Craftsmanship, available at http://www.it-ebooks.info/book/1441/.

Reference Links:

1. Agile software development, http://en.wikipedia.org/wiki/Agile_software_development
2. Scrum, http://en.wikipedia.org/wiki/Scrum_%28software_development%29
3. Extreme Programming, http://en.wikipedia.org/wiki/Extreme_programming
4. Feature-drive development, http://en.wikipedia.org/wiki/Feature-driven_development
5. Lean Software development, http://en.wikipedia.org/wiki/Lean_software_development
6. Test-driven development, http://en.wikipedia.org/wiki/Test-driven_development
7. Unit testing, http://en.wikipedia.org/wiki/Unit_testing
8. Specification by example, http://en.wikipedia.org/wiki/Specification_by_example
9. Behavior-driven development, http://en.wikipedia.org/wiki/Behavior-driven_development
10. Code refactoring, http://en.wikipedia.org/wiki/Code_refactoring
11. User Experience, http://en.wikipedia.org/wiki/User_experience

Tool Web Sites:

1. Ubuntu, http://www.ubuntu.com/desktop
2. Eclipse, https://eclipse.org/users/
3. jUnit, http://junit.org/
4. Git, http://git-scm.com/
5. Jenkins, https://jenkins-ci.org/
6. Ant, http://ant.apache.org/
7. Maven, https://maven.apache.org/
8. Cucumber, https://cukes.info/
9. Fitnesse, http://www.fitnesse.org/
10. Agilefant, http://agilefant.com/

Course Title/ Code	**Pedagogical skills(CSS510B)**
Course Type	**Elective**
Course Nature	**Workshop**
L-T-P-O Structure	(0-0-4-0)

Importance of pedagogy skills for teachers in Higher Education; Understanding the Learning styles of students; Developing learning objectives and outcomes for a course in alignment with Program Educational Objectives and Outcomes; Defining teaching methodologies for attainment of outcomes; assessment of Learning.

Objective: To give a broad design of learner centric course material.

Outcome: Shall be able to

1. Design Course Objectives and Outcomes in alignment to Program Education Objectives and Outcomes
2. Design Lesson Plan and specify teaching methodologies for attainment of outcomes
3. Design exercises for evaluation.

Teaching methodology: Problem Based Learning

Scenario: Write to your Head of the Department:Your Department is redesigning the teaching methodology of B Tech 1st Year Programming course. Consult the online resources to suitably design the following (i) Lesson Plan (ii) Teaching Method (iii) Measurement of Learning Outcomes keeping in view the different learning style of the students. Finally, using Writing Navigator, write a report for the Head of the Department, explaining your design with references referred to, beyond the prescribed ones (given below).

Submission: End of semester. (PT3 : Presentation & submission of report and viva voce Total 20 marks)

https://www.elo.iastate.edu/resources/

http://www.faculty.londondeanery.ac.uk/e-learning/setting-learning-objectives/writing-learning-outcomes-or-learning-objectives

http://www.unesco.org/new/en/education/themes/strengthening-education-systems/quality-framework/technical-notes/influential-theories-of-learning/

Laboratory/Activity Components:

Review of Papers: (PT1 Expected to be over by 7th week @5 marks each : presentation and viva)

- Teaching in higher education: Is there a need for training in pedagogy in graduate degree programs? Terrell E. Robinson; Warren C. Hope. Research in Higher Education Journal.
- Does Pedagogical Training Benefit the Engineering Educator?* Samuli Kolari; Carina Savander-Ranne. Global J. of Engg. Educ., Vol.6, No.1
- The effect of pedagogical training on teaching in higher education. Liisa Postareff, Sari Lindblom-Ylanne, Anne Nevgi. Teaching and Teacher Education 23 (2007) 557–571

Activities: PT2 @5 marks each : presentation and viva

- Interview at least 6 Faculty members to identify the teaching styles as mentioned by Kolari et.al. (completed by 5th week)
- Conduct a survey of at least 100 learners and analyse the learning styles. (completed by 8th week)
- Conduct a study to verify/contradict the statement: Teachers from harddisciplines were more likely to adopt an informationtransmission/teacher-focused (ITTF) approach toteaching, while teachers who represented softdisciplines took a more conceptual change/studentfocused(CCSF) approach to teaching. (completed by 10th week)

End Term Exam: 40 marks

10 questions @ 1mark -short answers; Two case studies @10 marks; Given a model syllabi design Learning objectives and outcomes- 10 marks; Knowledge based questions

10 marks continuous evaluation: Submissions on Washington Accord & Blooms Taxonomy

CSP01- Semester-II

COURSE CODE	COURSE NAME	Course Type	Course Nature	PERIODS				CREDITS
		Core(Departmental/Allied)/ Elective (Departmental/ Open) / University Compulsory	Hard/Soft/ Workshop/ NTCC	L	T	P	O	
CSH511B-T & P	Data Science	Domain Core	Hard	3	0	2	0	4
CSH512B T &P	Business Intelligence	Domain Core	Hard	3	0	2	0	4
CSH513B-T & P	Optimization Technique	Domain Elective	Hard	3	0	2	0	4
ECH618 T &P	Wireless Sensor Networks	Allied Elective	Hard	3	0	2	0	
CSH514B-T &P	Data Preparation & Analysis	Domain Elective	Hard	3	0	2	0	
CSH515B-T &P	User Experience	Domain Elective	Hard	3	0	2	0	4
CSH516B-T &P	Cloud Computing	Allied Elective	Hard	3	0	2	0	
CSH517B T &P	Data Visualization With Tableau	Domain Elective	Hard	0	0	3	0	1.5
CSW518B	Mini Project With Seminar	Domain Core	Workshop	0	0	2	0	1
CSS519B	Professional And Ethical Issues	Domain Core	Soft	2	0	0	0	0

Course Title/ Code	**Data Science (CSH604B-T&P)**
Course Type:	**Domain Elective**
Course Nature:	Hard
L-T-P-O Structure	(3-0-2-0)
Prerequisite	Basic Python programming
Objectives	At the end of the course the students should be able to ● Develop in depth understanding of the key technologies in data science. ● Demonstrate the understanding of a wide variety of machine learning algorithms to solve classification and regression problems.

	Sections	Weightage
Syllabus	A	25%
	B	25%
	C	25%
	D	25%
	TOTAL	**100%**

Section A

Introduction to DS: Introduction and history of DS, Benefits and uses of data science, Scale of Measurements (Nominal, Ordinal, Ratio and Interval), Measures of Location, Measures of Variability/Spread, and Measures of Shape.

Types of data: Facets of data, Structured data, Unstructured data, Natural language, Machine-generated data, Graph-based or network data, Audio, image, and video, Streaming data.

Section B

Data Science Statistics: Basic Statistical Concepts: mean, mode, median, Standard deviation, Normal Distribution Principle of counting, definitions of probability theory, independent events, mutually exclusive events, collectively exhaustive events, conditional probability, Bayes Theorem, covariance, correlation, normal distribution, P-Value, T-Value, Confidence Interval, t-distribution and chi square distribution.

Section C

The data science process: Overview of the data science process: Defining research goals and creating a project charter, Retrieving data, Cleansing, integrating, and transforming data, Data visualization & Exploratory data analysis, Build the models, Presenting findings.

Data Science & Machine Learning: Introduction and history of ML, Overlap between DS, ML and AI, Applications of DS & ML in the modern context. Introduction to Machine Learning: Concept & Theory: Machine learning pipe line.

Section D

Regression & Classification: Difference between Regression and classification, Linear Regression, Multiple liner regression single, Bias / Variance, Training and Testing, Evaluation measures **Classification:** Logistic Regression, Support Vector Machines, Decision Trees, naive-Bayes.

Text Books:

1. Introducing Data Science by Davy Cielen, Arno D.B Meysman and Mohammed Ali, Manning Publication, 2016
2. Data science:theories, models, algorithms, and analytics, Sanjiv Ranjan Das, 2016
3. Deep Learning, An MIT Press,Ian Goodfellow and YoshuaBengio and Aaron Courville, 2018.

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2009.

Lab Experiments:

1. Reading a Data
2. Data Visualization
3. Exploratory data Analysis
4. Handling Missing Data
5. Implementations Linear Regression
6. Implementations Multiple Linear Regression
7. Implementations of Decision tree
8. Implementations of SVM
9. Implementations Naïve Bayes

Course Title/ Code	**Business Intelligence (CSH512B)**
Course Type	**Elective**
Course Nature	**Hard**
L-T-P-O Structure	(3-0-2-0)
Objectives	To develop knowledge and expertise on how to select and/or develop, and deploy successful business intelligence systems to assist managers in decision making.

Section- A

Introduction to data warehouse: DW definition, 3 – Tier data warehouse architecture, OLAP server – ROLAP, MOLAP, HOLAP; OLTP vsOLAP,Metadata, role of metadata repository in data warehouse, data mart, distributed and virtual data warehouses, quality issues in data warehouse.

Introduction to Business Intelligence: BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities.

Section-B

Basics of Data Integration and ETL : Concepts of data integration, need and advantages of using data integration, introduction to common data integration approaches, Data preprocessing, ETL Process, extract transform Load, ETL Tools &ETL concepts: Source system, Mapping, Metadata Data, Staging Area, Cleansing, Transformation Introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications.

Section-C

Introduction to Multi-Dimensional Data Modeling: Introduction to data and dimension modeling, multi-dimensional data model, ER Modeling vs. multidimensional modeling, concepts of dimensions, facts, cubes, attribute, measures, introduction to business metrics and Key Performance Indicator,hierarchies, Stars, snowflakes and fact constellations and defining schemas, OLAP operations , creating cubes using SSAS.

Section-D

Basics of Enterprise Reporting

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

List of Experiments

Using SQL Server along with Business Intelligence Development Studio (BIDS):

1. SSIS SQL Server Integration Services
2. SSAS SQL Server Analysis Services
3. SSRS SQL Server Reporting Services

There will be 2 projects

a) Project 1: Data in disparate data sources such as Excel, text file, databases etc. will be provided to the students. They will be expected to extract, cleanse, integrate and load it into the data-warehouse.

b) Project 2: Design reports according to given business scenarios. The data for the reports is to be pulled from the data-warehouse built in the earlier project.

Text Books:

1. R N Prasad, SeemaAcharya, “Fundamentals of Business Analytics”, Wiley

Reference Book:

1. David Loshin, “Business Intelligence”, Elsevier
2. Mike Biere, “Business intelligence for the enterprise”, IBM Press
3. Larissa Terpeluk Moss, ShakuAtre, “Business intelligence roadmap”, Addison-Wesley Professional
4. CindiHowson, “Successful Business Intelligence: Secrets to making Killer BI Applications”, McGraw Hill
5. Brain, Larson,”Delivering business intelligence with Microsoft SQL server 2008”, McGraw Hill
6. Lynn Langit, “Foundations of SQL Server 2005 Business Intelligence”, Apress
7. Stephen Few, “Information dashboard design”, OReilly

Course Title/ Code	**Optimization Techniques (CSH513B)**
Course Type	**Elective**
Course Nature	**Hard**

L-T-P-O Structure	(3-0-2-0)
Objectives	To prepare the data for analysis and develop meaningful Data Visualizations.

Section-A

Engineering application of Optimization, Formulation of design problems as mathematical programming problems. General Structure of Optimization Algorithms, Constraints, The Feasible Region.

Section-B

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

Section-C

Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc. Real life Problems and their mathematical formulation as standard programming problems.

Section-D

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

References:

1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.
2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.
3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.
4. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.
5. John K. Karlof (2006). Integer programming: theory and practice.CRC Press. ISBN 978-0-8493- 1914-3. 6. H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.
7. Michael Jünger; Thomas M. Liebling; Denis Naddef; George Nemhauser; William R. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A. Wolsey, eds. (2009). 50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art. Springer. ISBN 978-3- 540-68274-5.
8. Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN 978-0-470-37306-4.

Course Title/ Code	**WIRELESS SENSOR NETWORK (ECH618B-T)**
Course Type:	Elective
Course Nature:	Hard
L-T-P-O Structure	(3-0-2-0)
Objectives	Students will be able to implement communication network using wireless sensors.

Section A

Introduction and Overview of WSN: Introduction, Brief historical survey of sensor networks, Challenges for wireless sensor networks, Enabling technologies for wireless sensor networks, Ad-Hoc networks, Applications of wireless sensor networks: Sensor and robots, Reconfigurable sensor networks, Highway monitoring, Military applications, Civil and environmental engineering applications, Wildfire instrumentation, Habitat monitoring, Nanoscopic sensor applications, Wireless Network Standards: IEEE 802.15.4.

Section B

Architecture: Basic sensor network architectural elements, Single node architecture, Hardware components, Energy consumption of sensor nodes, Operating systems and execution environments, Network architecture, Sensor network scenarios, Optimization goals and figures of merit, Gateway concepts.

Section C

Medium Access Control for WSN: Physical layer and transceiver design Considerations, MAC protocols for wireless sensor, Networks, Low duty cycle protocols and wakeup concepts -Box-MAC, Bit-MAC, H-MAC, I-MAC, O-MAC, S-MAC , The mediation device protocol, Wakeup radio concepts, Address and name management, Assignment of MAC addresses, Routing protocols- Energy efficient routing, Geographic routing, Flooding and its variants.

Section D

Infrastructure Establishment: Topology control, Clustering, Time synchronization, Localization and positioning, Sensor tasking and control, Examples of operating systems: TinyOS,Mate, MagnetOS.

List of Experiments:

1. Optimum Placements of sensors in wireless sensor network.
2. Sensor placement for effective diagnosis of multiple faults.
3. To generate a random matrix.
4. Generate a data matrix of the designated pattern vectors
5. Find the Fisher Information matrix associated to this matrix
6. Calculate the determinant for the Gram matrix for each sensor. This is done by deleting the rows and columns of matrix corresponding to the sensor reading with lowest interference, thus providing effective independence for the chosen sensor location
7. Remove the sensor which has least determinant from the data matrix by obtaining the matrix,
8. Add the next column from the matrix of data in order to update the Gram matrix with a new sensor. This procedure is repeated until an optimum matrix is obtained with all optimum sensor location sets.

Text Books:

1. Holger Karl & Andreas Willig, Protocols And Architectures for Wireless Sensor Networks, John Wiley.
2. Feng Zhao & Leonidas J. Guibas, Wireless Sensor Networks- An Information Processing Approach, Elsevier

Reference Books:

1. KazemSohraby, Daniel Minoli, TaiebZnati,Wireless Sensor Network, John Wiley.
2. Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong, Wireless Sensor Networks Signal Processing and Communications, John Wiley.
3. Murthy,Adhoc Wireless Networks: Architectures And Protocols, Pearson Education.
4. C. S. Raghavendra, Wireless sensor networks, Springer.

Course Title/ Code	Data Preparation and Analysis (CSH514B)
Course Type	Elective
Course Nature	Hard
L-T-P-O Structure	(3-0-2-0)
Objectives	To prepare the data for analysis and develop meaningful Data Visualizations.

Section-A

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues.

Section-B

Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation.

Section-C

Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation.

Section-D

Visualization: Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity.

Course Title/ Code	User Experience(CSH515B)
Course Type	Core
Course Nature	Hard
L-T-P-O Structure	(3-0-2-0)
Objectives	Students will be able to learn the ability to design good interface. To make clear distinction between good design and better design.

Section – A

Overview of HCI, Theories and Principles

HCI: Introduction to HCI, Goals of System Engineering, Goals of User-Interface Design, Usability of Interactive Systems Motivations for Human Factors in Design, Guidelines, Principles and Theories, Conceptual, Semantic, Syntactic and Lexical Model, GOMS (Goals, Operators, Methods, and Selection) and Keyboard-level model, HCI, Object-Action Interface Model.
Interaction Styles: Introduction to interaction Devices, Keyboards and Function Keys, Pointing Devices, Speech and Auditory Interfaces, Speech Recognition, Image and Video Displays, Printers, Response Time and Display Rate with Respect to Display, Goals of Collaboration, Asynchronous and Synchronous Interfaces, Face-to-Face Interfaces.

Section –B

Managing Design Processes and Tools and Testing
Design Processes: Three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Expert Reviews.
Tools and Testing: Usability Testing and Laboratories, Acceptance Testing, Evaluation during Active Use, Specification Methods, Interface Building Tools, Evaluation Tools.

Section-C

Design Principles for Designing GUI Objects: Direct Manipulation (examples, explanations), Visual Thinking and Icons, 3D Interfaces, Virtual Reality, Introduction to Menu Selection, Form Fill-in and Dialog Boxes, Task Related Organizations, Fast Movement through Menus, Item Presentation Sequences, Response Time and Display Rate, Data Entry with Menus Menu Layout, Command-Organizational Strategies, Naming and Abbreviations, Command Menus, Natural language in Computing.

Section – D

Presentation Design Issues and Information Search & Visualization
Presentation Design Issues: Error Messages, Display Design, Individual-Window Design, Multiple Window Design and Coordination by Tightly-coupled Windows, Color.
Information Search & Visualization: Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization, OAI Model for Website Design.

List of Experiments

1. Introduction to PENCIL Tools and its Controls.
2. To study the process of creating an animation with 2D objects, motion and sound.
3. To draw the Path and resizable shapes.
4. To draw the images and special constraints for Dimension and Handle.
5. Using external SVG.
6. Drawing sketchy lines.
7. Use of External JavaScript.
8. Designing a User Interface.
9. Creating a PENCIL based Presentation with UI Controls.
10. Project based on PENCIL.

Text Books:

1. Schneiderman, Ben and Catherine Plaisant, Designing the User Interface (DTUI), Fifth edition, (Addison-Wesley, 2010)
2. Dix, Alan, Janet Finlay, Gregory D Abowd, Russell Beale, Human-Computer Interaction (HCI), Third edition (Pearson, 2004)

Reference Books:

1. Bill Buxton, Sketching User Experiences: Getting the Design Right and the Right Design (Interactive Technologies) , Elsevier, 2007.
2. Bill Moggridge, Designing Interactions , MIT Press, 2008.

Course Title/ Code	Cloud Computing(CSH516B)
Course Type	Elective
Course Nature	Hard
L-T-P-O Structure	(3-0-2-0)
Objectives	Students will be able to learn the concepts, techniques and implementation of clouds.

Section-A

Overview of Cloud Computing: Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing. Why Cloud Computing, Cloud service models (IaaS, PaaS&SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud, Benefits and Challenges of Cloud Computing.

Working with Private Cloud: Basics of virtualization, Virtualization technologies, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing. Business cases for the need of Cloud computing environment, Private Cloud Definition, Characteristics of Private Cloud, Private Cloud deployment models, Private Cloud Vendors, Private Cloud Building blocks namely Physical Layer, Virtualization Layer, Cloud Management Layer, Challenges to private Cloud, Virtual Private Cloud. Implementing private cloud (one out of CloudStack, OpenStack, Eucalyptus, IBM or Microsoft)

Section-B

Working with Public Clouds: What is Public Cloud, Why Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud Players. Infrastructure as a Service Offerings, IaaSVendors, PaaS offerings, PaaS vendors, Software as a Service. Implementing public cloud (one out of AWS, Windows Azure, IBM or Rackspace).

Application Development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

Section-C

Overview of Cloud Security: Explain the security concerns in Traditional IT, Introduce challenges in Cloud Computing in terms of Application Security, Server Security, and Network Security. Security reference model, Abuse and Nefarious Use of Cloud Computing, Insecure Interfaces and APIs, Malicious Insiders, Shared Technology Issues, Data Loss or Leakage, Account or Service Hijacking, Unknown Risk Profile, Introduce the different vendors offering Cloud Security for public and private clouds.

Overview of Multi-Cloud Management Systems: Explain concept of multi-cloud management, Challenges in managing heterogeneous clouds, benefits and advantages of multi-cloud management systems. Implementing Multi-Cloud Management System (e.g. RightScale Cloud Management System)

Future directions in Cloud Computing: Future technology trends in Cloud Computing with a focus on Cloud service models, deployment models, cloud applications, and cloud security. Migration paths for cloud, Selection criteria for cloud deployment.Current issues in cloud computing leading to future research directions.

Section-D

Business Clouds: Cloud Computing in Business, Various Biz Clouds focused on industry domains (Retail, Banking and Financial sector, Life Sciences, Social networking, Telecom, Education). Cloud Enablers (Business Intelligence oncloud,BigDataAnalyticsonCloud).

Best Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

List of Experiments

1. Creation of EC2 Instance on Amazon.
2. Implementation of Load Balancing.
3. Deployment of various services on Amazon.
4. Design, development and implementation of a given business application.
5. Management of one application using multi-cloud management.
6. Case Study of Computing PI with Clouds.
7. Case Study of Association of clouds with mining.

Text Books:

1. A Practical Approach Cloud Computing: By Anthony T Velte, Toby J Velte, Robert C Elsenpeter.
2. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, *Kai Hwang, Jack Dongarra and Geoffrey Fox,* Morgan Kaufmann, 2011

Reference Book:

1. Cloud computing: Implementation, management and security By Rittinghouse, John, and W.
2. Cloud Computing Bible, By Barrie Sosinsky, Wiley, 2011.
3. Cloud Computing Architected: Solution Design Handbook by Rhoton, John.
4. Cloud Security, A comprehensive Guide to Secure Cloud Computing by Krutz, Ronald L.; Vines, Russell Dean.
5. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski, 2011

Course Title/ Code	**DATA VISUALIZATION WITH TABLEAU (CSH517B)**
Course Type	**Elective**
Course Nature	**Hard**

L-T-P-O Structure	(3-0-2-0)
Objectives	To model and design an object oriented system.

Section-A

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

Section-B

Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Section-C

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization.

Section-D

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations. Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Reference Book:

1 WARD, GRINSTEIN, KEIM,.Interactive Data Visualization: Foundations, Techniques, and Applications. Natick : A K Peters, Ltd.
2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

Course Title/ Code	**PROFESSIONAL & ETHICAL ISSUES (CSS519B)**
Course Type	**Domain Core**
Course Nature	**Soft**
L-T-P-O Structure	**(2-0-0-0)**
Course Objectives	To enable the students to create an awareness on Professional Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.
Course Outcome	Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to profession and realize the responsibilities and rights in the society.

Section A

HUMAN VALUES: Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

Section B

PRPFESSIONAL ENGINEERING ETHICS: Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

Section C

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

Section D

GLOBAL ISSUES: Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

Text Books:

1. Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

References:

1. Charles B. Fleddermann, Engineering Ethics, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, Engineering Ethics -Concepts and Cases, Cengage Learning, 2009.
3. John R Boatright, Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, Business Ethics: Decision Making for Personal Integrity and Social Responsibility Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, Value Education, Vethathiri publications, Erode, 2011.

Web Sources:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

CSP01- Semester-III

COURSE CODE	COURSE NAME	Course Type	Course Nature	PERIODS				CREDITS
		Core(Departmental/Allied)/ Elective (Departmental/ Open) / University Compulsory	Hard/Soft/ Workshop/ NTCC	L	T	P	O	
CSH601B T &P	Internet Of Things	Domain Elective	Hard	3	0	2	0	4
CSH602B T &P	Big Data	Domain Elective	Hard	3	0	2	0	
CSH603B T &P	Mobile Applications & Services	Domain Elective	Hard	3	0	2	0	
MEH519B	Non Conventional Energy Sources	Allied Elective	Hard	3	0	2	0	4
MEH518B	Operations Research	Allied Elective	Hard	3	0	2	0	
CSH604B T &P	Machine Learning	Domain Elective	Hard	3	0	2	0	
CSN605B	Dissertation Project (Stage I)	Domain Core	NTCC	0	0	16	0	8

Course Title/Code	**Internet Of Things (CSH601B)**
Course Type	**Elective**
Course Nature	**Hard**
L-T-P-O Structure	(3-0-2-0)
Objectives	Student will be able to do understand the application areas of IOT. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks. Able to understand building blocks of Internet of Things and characteristics.

Section-A

Introduction to IoT: Definition of IoT, Evolution of IoT, IoT and related terms, Business Scope. Effects of adverse parameters for the living being for IOT

Section-B

Elements of IoT: Elements of IoT, Basic Architecture of an IoT Application Sensors & Actuators, Edge Networking (WSN), Gateways, IoT Communication Model – WPAN & LPWA. Importance and Adoption of Smart Sensors.

Section-C

Communication and Connectivity Technologies: Cloud Computing in IoT, IoT Communication Model – Cloud Connectivity, Big Data Analytics, Data Visualization, IoT Platforms.

Section-D

Concerns and Future Trends: Different Players of IoT, Security Concerns and Challenges, Future Trends, Standards. **Hands-On Projects**

LIST OF EXPERIMENTS:

1. IOT and Acoustic and Sound Sensors.
2. IOT and Chemical Sensors
3. IOT and Optical Sensors
4. IOT and Mechanical Sensors
5. IOT and Electromechanical Sensors
6. IOT and Thermal Sensors
7. IOT and Proximity Sensors
8. IOT and Pressure Sensors
9. IOT and Magnetic Sensors
10. Mini Project

Course Title/Code	**Big Data (CSH602B)**
Course Type	**Elective**
Course Nature	**Hard**
L-T-P-O Structure	(3-0-2-0)
Objectives	Student will be able to do Big Data Programming and Analytics using Hadoop.

Section-A

Introductory Concepts (Digital Data and Big Data):Digital Data Basics,Types of Digital Data (Structured, Semi-Structured, Unstructured),Introduction to Big Data Platform, Dimensions of Big Data, Challenges with Big Data, Big Data Architecture, Big Data Algorithm, Big Data visualization, Big Data Stack,ScalingProblems.Big data processing tools(AWS).

Hadoop overview: Brief history of Hadoop, Hadoop 1.0 vs. Hadoop 2.0, Hadoop Components, High level

architecture of Hadoop, Hadoop Streaming, Hadoop Compression.

Section-B

Big Data Analytics : Analytics 1.0, Analytics 2.0, Analytics 3.0,Traditional BI vs. Big Data Environment ,Big Data technology Landscape, NoSQL Databases, NoSQL Vs. RDBMS, New SQL .
Frameworks: Fundamentals of PIG, HIVE, HBASE, ZOOKEEPER, SQOOP.

Section-C

Big data programming using Hadoop: Hadoop Distributed File System: Architecture, Daemons related to HDFS, working with HDFS command, Special features of Hadoop, Introduction to functional programming, How Map Reduce Works, Mapreduce on YARN, Map Reduce Joins, Map Reduce Work Flows. HDFS and Hadoop Ecosystem.

Section-D

Interacting with Hadoop Ecosystem,**APACHE HIVE:** History of HIVE,HIVE architecture, Hive Primitive Data Types and Collection Types, Hive File Formats ,Hive Query Language – Statements,DDL DML ,:History and anatomy of PIG,PIG on Hadoop, PIG features, PIG Philosophy, Fundamentals of APACHE PIG& HBASE ,Business Intelligence on Hadoop. Case Study: Hadoop and Hive at facebook

List of Experiments

1. To Install and set up of Hadoop along with Start up and shut down process.
2. Introduction to (Hadoop Distributed File System) labs
    - Loading data
    - Viewing the cluster contents
    - Getting data out of the cluster
3. To write basic map reduce program
    - Driver code
    - 3Mapper
    - Reducer
4. To Creating Input and Output formats in Map Reduce Jobs
    - Text Input format
    - Key value input format
    - Sequence file input format
5. To implementing Latin commands on pig/ How to use basic pig commands
6. Introduction to processing data with Hive
    - Creating tables with Hive
    - Managing hive table data location and lifetime
        - Loading data into hive tables
    - Partitioning the data
    - Querying tables with Hive QL
7. Project

Text Books:

1. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
2. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
3. Michael Minelli (Author), Michele Chambers (Author), AmbigaDhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,Wiley Publications,2013.

Reference Books:

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012.
2. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CambridgeUniversity Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007.
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
6. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 201

Course Title/ Code	**Mobile Application and Services (CSH603B) T**
Course Type:	**Elective**
Course Nature:	Hard Course
L-T-P-O Structure	(3-0-0-0)
Objectives	Students would be able To develop Android applications and application services

Section –A

INTRODUCTION TO ANDROID AND ITS CONCEPTS: Overview of Android Ecosystem, Introduction to Android SDK, Android application building block, features of Android Studio, Android Platform Architecture, Challenges in development, Environment setup & Installation of Android Studio, AVD Setup. Design Criteria for Android Application including Hardware Design, Views: GUI, XML, Programmatically (TextView, EditText, Button, ToggleButton, Spinner, ImageView, etc), View component properties, Activity and AppCompActivity, Activity life Cycle, Intents: Implicit and Explicit**,** Manifest File. Layouts (Constraint, Linear, Relative, Table, GridView) and Layout Properties. Android Resources.

Section-B

USER INTERFACE: Component Event Handle, Component Focus, Threads, Menu: Appbar with Option menu, Contextual menu, Pop Menu, Sub menu, and menu via XML and Code, Dialog, Navigation: Back & Hierarchy, Array & Base Adapters. Custom List View, Grid View using adapters & Recycler View, Styles and Themes, Adaptive Layout and Resource. Testing using Espresso.
BACKGROUND OPERATION: AsyncTask and AsyncTaskLoader,

Section-C

DATABASES AND ANIMATIONS: Storing Options: Shared Preference, Internal & External Storage, SQLite, SQLite Operation, and Sharing Data between Applications with Content Providers and Content Resolver. Working with Cursors: Inserts, Update and delete. Reading and Updating Contacts, Reading Bookmarks. Graphics and Animation: Custom views, Canvas, animation APIs, Multimedia: Audio, Video. Permission, performance and Security. Firebase feature and App publish.

Section-D

MOBILE SERVICES: Broadcast Receivers, Service, Notification. Creating consumable web services for mobile devices, Debugging Web Services.

LIST OF EXPERIMENTS:

1. Installation and setup of java development kit(JDK),setup android SDK,setup eclipse IDE,setup android development tools (ADT) plugins,create android virtual device.
2. Create “Hello World” application. That will display “Hello World” in the middle of the screen using TextView Widget in the red color.
3. Create application for demonstration of android activity life cycle and Scroll View in Android.
4. Create an application for demonstration of Relative and Table Layout in android.
5. Create Registration page to demonstration of Basic widgets available in android.
6. Create sample application with login module. (Check username and password). On successful login, ChangeTextView “Login Successful”. And on failing login, alert user using Toast “Login fail.
7. Create login application where you will have to validate username and passwords till the username and password is not validated, login button should remain disabled.
8. Create an application to run Explicit Activity using Intent.
9. Create an application that will get the Text entered in Edit Text and display that text using Toast.
10. Create an application that will pass two numbers using TextView to the next screen, and on the next screen display the sum of that number.
11. Create an application to Demonstrate Dialog Box Control In Android.
12. Create an UI such that one screen have list of all the types of cars. On selecting any car name, next screen should show Car details like: name, launched date, Company name using database connectivity.
13. Run audio file in the background of previous application.
14. Animate an image view when it is clicked.

Text Books:

1. Lauren Darcey and Shane Conder“AndroidWirelessApplicationDevelopment”, Pearson Education, 2nd ed. (2011)
2. Joseph Annuzzi Jr., Lauren Darcey, Shane, “Advanced Android Application Development”, Addison Wisely.

Reference Book:

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd (2011).
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd(2009)
3. Marko Gargenta”LearningAndroid”WileyIndiaPvt Ltd.

Course Title/ Code	**OPERATION RESEARCH (MEH518B)**
Course Type	**OPEN ELECTIVE**
Course Nature	**HARD**
L-T-P-O Structure	**3-1-2-0**
Prerequisite	**NIL**

SECTION A

Engineering Economy and Costing**:** Elementary cost accounting and methods of depreciation; break-even analysis, techniques for evaluation of capital investments, financial statements.

Facility Design**:** Facility location factors and evaluation of alternate locations; types of plant layout and their evaluation; assembly line balancing; materials handling systems.
Production Planning and Inventory Control**:** Forecasting techniques – causal and time series models, moving average, exponential smoothing, trend and seasonality; concept of JIT manufacturing system;

SECTION B

Inventory: functions, costs, classifications, deterministic and probabilistic inventory models, quantity discount; perpetual and periodic inventory control systems.
Linear programming: problem formulation, simplex method, duality and sensitivity analysis;

SECTION C

Transportation and assignment models; network flow models, simple queuing models; dynamic programming; simulation – manufacturing applications; PERT and CPM, time-cost trade-off, resource leveling.

SECTION D

Quality Management**:** Quality – concept and costs, quality circles, quality assurance; statistical quality control, acceptance sampling, zero defects, six sigma; total quality management; ISO 9000; design of experiments – Taguchi method.
Management Information System**:** Value of information; information storage and retrieval system database and data structures; knowledge based systems.

TEXT BOOK & REFERENCES:

1. Production Systems: Planning, Analysis and Control by J.L. Riggs
2. Production, Planning and Inventory Control by S. Narasimhan, D. W. McLeavey, and P. J. Billington
3. Operation Research by D.S.Heera, S. Chand Publication

LIST OF EXPERIMENTS:

1. To prepare a case study for producing a product on shop floor covering areas of PPC, design, Methods Engineering, Operations and Quality Control.
2. To prepare a project report for calculating the total cost (direct and indirect cost) of a product being developed for manufacturing.
3, To prepare a flow chart identifying main steps to be followed by methods engineering in manufacturing a product.
4. To prepare a bar chart for producing a generator/turbine identifying the main sub-assemblies along with their completion schedule.
5. To prepare a document for quality policy, quality systems and procedures required to be followed in the manufacture of a turbine/generator.

Course Title/ Code	**NON CONVENTIONAL ENERGY SOURCES (MEH519B)**
Course Type	**CORE**
Course Nature	**HARD**
L-T-P-O Structure	**3-1-2-0**
Prerequisite	**NIL**

SECTION A

Introduction to Energy Sources: Renewable and non-renewable energy sources, energy consumption as a measure of Nation's development; strategy for meeting the future energy requirements Global and National scenarios, Prospects of renewable energy sources.

Solar Energy : Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, Solar air heaters-types, solar driers, storage of solar energy-thermal storage, solar pond , solar water heaters, solar distillation, solar still, solar cooker, solar heating & cooling of buildings, photo voltaics - solar cells & its applications.

SECTION B

Wind Energy : Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

Energy from Biomass: Biomass conversion technologies, Biogas generation plants, classification, advantages and disadvantages, constructional details, site selection, digester design consideration, filling a digester for starting, maintaining biogas production, Fuel properties of bio gas, utilization of biogas.

SECTION-C

Geothermal Energy: Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India

Energy from the ocean: Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India. Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy.

SECTION-D

Magneto Hydro Dynamic (MHD) Power Generation: Principle of MHD power generation, MHD system, Design problems and developments, gas conductivity, materials for MHD generators and future prospects. 8. Fuel Cells: Introduction, Design principle and operation of fuel cell, Types of fuel cells, conversion efficiency of fuel cell, application of fuel cells.

Hydrogen Energy: Introduction, Hydrogen Production methods, Hydrogen storage, hydrogen transportation, utilization of hydrogen gas, hydrogen as alternative fuel for vehicles. Energy Management: Energy economics, energy conservation, energy audit, general concept of total energy system, scope of alternative energy system in India. Term work is based on above mentioned syllabus

Reference Books:

1. Non-conventional energy sources by G.D. Rai, Khanna Publishers
2. Solar Energy: Fundamentals and Applications by H.P. Garg & Jai Prakash, Tata McGraw Hill
3. Solar Energy: Principles of Thermal Collection and Storage by S,P Sukhatme, Tata McGraw Hill
4. Alternative Energy Sources by B.L. Singhal Tech Max Publication
5. Non Conventional Energy Resources by S.Hasan Saeed and D.K.Sharma
6. Fuel Cells by Bockris and Srinivasan; McGraw Hill
7. Magneto Hydrodynamics by Kuliovsky and Lyubimov, Addison
8. Solar Engineering of Thermal Processes by Duffic and Beckman, John Wiley.

Course Title/ Code	**Machine Learning(CSH604B)**
Course Type	**Hard**
Course Nature	**Elective**
L-T-P-O Structure	(3-0-2-0)
Objectives	Students will be able to learn instance based learning algorithms , Analyze probabilistic methods for learning and Build optimal classifiers using genetic algorithms

Section-A

Introduction – Well defined learning problems, Designing a Learning System, Issues in Machine Learning.
The Concept Learning Task - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias.
Decision Tree Learning - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning.

Section-B

Artificial Neural Networks – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule-Backpropagation Algorithm- Convergence, Generalization
Evaluating Hypotheses – Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms.
Bayesian Learning – Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.

Section-C

Computational Learning Theory– Sample Complexity forFinite Hypothesis Spaces, Sample Complexity for Infinite Hypothesis Spaces, the Mistake Bound Model of Learning; -
Instance-Based Learning –K-Means, K-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Function Networks, Case-Based Learning.

Section-D

Genetic Algorithms – an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL
Reinforcement Learning - The Learning Task, Q Learning.

List of Experiments

1. Introduction to Matlab: Arithmetic,Logical,Bitwiseetc operations.
2. Vectors and Matrix Algebra and its Operations.
3. Logistic Regression
4. K-Means Clustering
5. k-Nearest Neighbor Classification Method
6. Naive Bayes Classifier
7. Decision Trees (CART)

8. AdaBoost
9. Support Vector Machines (SVM)
10. Apriori Algorithm

Text Books:

1. Tom.M.Mitchell, Machine Learning, McGraw Hill International Edition
2. Ethern Alpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005.

Reference Books:

1. Jaime Guillermo Carbonell and Tom Michael Mitchell, “Machine Learning”, MorganKaufmann, 1994.

CSP01- Semester-IV

COURSE CODE	COURSE NAME	Course Type	Course Nature	PERIODS				CREDITS
		Core(Departmental/Allied)/ Elective (Departmental/ Open) / University Compulsory	Hard/Soft/ Workshop/ NTCC	L	T	P	O	
CSN606B	Dissertation	Domain Core	NTCC	0	0	32	0	16