STUDENT HANDOUT

AY: 2016 - 17

Dr. MAHALINGAM MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Technical Minds

BACHELOR OF ENGINEERING (B.E.)
COMPUTER SCIENCE AND ENGINEERING
Dr. MAHALINGAM COLLEGE OF ENGINEERING AND TECHNOLOGY, POLLACHI – 642003 INDIA
AN AUTONOMOUS INSTITUTION (Approved by AICTE, Affiliated to Anna University, ISO 9001:2008 Certified)

CONTENTS

1 INSTITUTE VISION AND MISSION

Vision of the Institute:

We develop a globally competitive workforce and entrepreneurs.

Mission of the Institute:

Dr.Mahalingam College of Engineering and Technology, Pollachi endeavors to impart high quality, competency based technical education in Engineering and Technology to the younger generation with the required skills and abilities to face the challenging needs of the industry around the globe. This institution is also striving hard to attain a unique status in the international level by means of infrastructure, state-of-art computer facilities and techniques.

2 DEPARTMENT VISION AND MISSION

Vision of the Department:

To develop engineers with global employability, entrepreneurship capability, research focus and social responsibility

Mission of the Department:

- To develop internationally competent engineers in dynamic IT field by providing state-of-art academic environment and industry driven curriculum.
- To motivate and guide students to take up higher studies and establish entrepreneurial ventures.
- To enrich the department through committed and technically sound faculty team with research focus in thrust areas.
- To undertake societal problems and provide solutions through technical innovations and projects in association with the industry, society and professional bodies

3 GRADUATE ATTRIBUTES

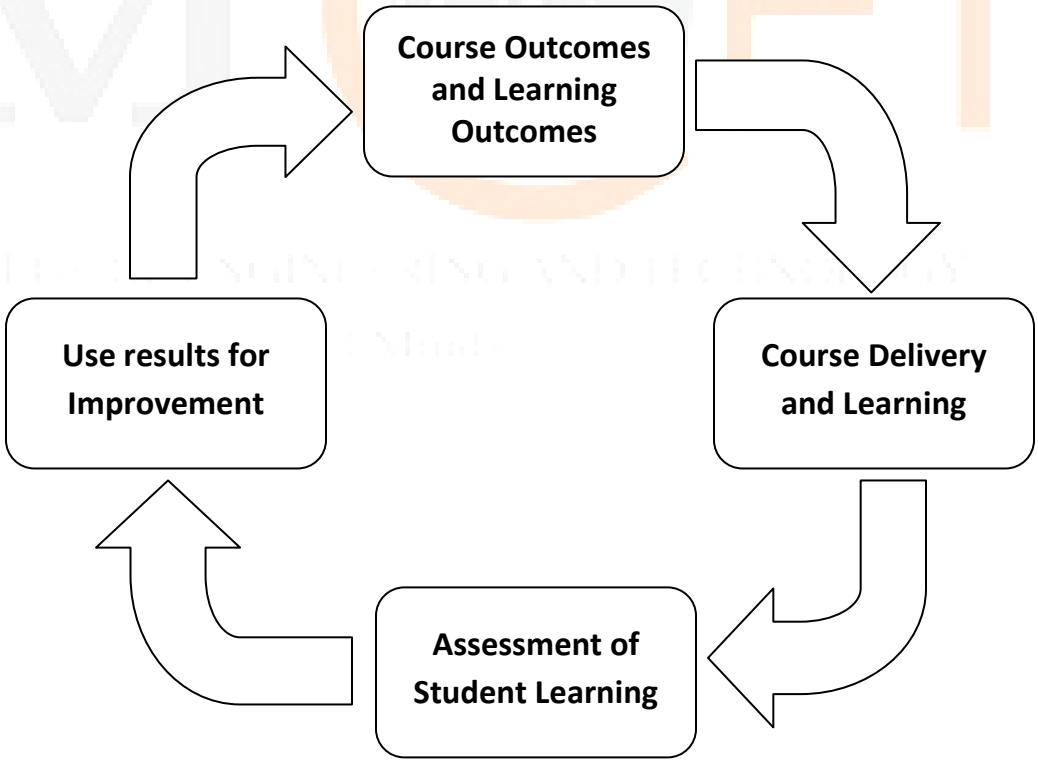
1 Engineering Knowledge
2 Problem Analysis
3 Design and Development of Solutions
4 Conduct Investigations of complex problems
5 Modern Tool Usage
6 Engineer and Society
7 Environment and Sustainability
8 Ethics
9 Individual and Team work
10 Communication
11 Project Management & Finance
12 Lifelong Learning

4 OUTCOME BASED EDUCATION

Outcome-Based Education (OBE) at MCET

MCET has stepped into outcome-based education (OBE) to meet out the global standards and expectations from its stake-holders in all its engineering programmes. The goal of our institution is to create entrepreneurs, innovators, engineers and scientists with good ethical and professional values by adapting OBE. To achieve and to enhance the learning outcomes, Outcome Based Education at MCET, continuously develops and raises the capabilities of teaching, learning and evaluation. The objectives of OBE model is to:

- Transform the learners into employable engineering professional with skill based competence and behavioral competence.
- Redesign of curriculum, teaching-learning methods, assessment and reporting practices in education based on the inputs from Stakeholders
- Create a clear expectation of what needs to be accomplished by the end of the course
- Create Learner-centric environment



5 PROGRAMME EDUCATIONAL OBJECTIVES

The Programme Educational Objectives of our department are:

Our graduates will

PEO1.**Domain Expertise**: Possess expertise and emerge as key players in IT integrated domains

PEO2.**Computing Skills and Ethics**: Employ computing skills to solve societal and environmental issues in an ethical manner

PEO3.**Lifelong Learning and Research**: Involve in lifelong learning and research to meet the demands of global technology

6 PROGRAMME OUTCOMES

The following are the Programme Outcomes of the course Bachelor in Computer Science and Engineering:

PO1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and concepts of Computer Science to solve complex engineering problems

PO2. **Problem Analysis:** Identify, review literature, formulate and analyse complex engineering problems using first principles of mathematics and engineering sciences

PO3. **Design and Development of Solutions:** Design and develop computing solutions for complex engineering problems with societal and environmental awareness

PO4. **Complex problem Investigation:** Investigate complex problems by employing research methods to arrive at valid conclusions

PO5. **Modern Tool Usage:** Evaluate and use appropriate tools and techniques in engineering activities

PO6. **Societal Contribution:** Follow professional engineering practice by applying contextual knowledge to assess societal and legal issues

PO7. **Environment and Sustainability:** Understand and provide professional engineering solutions taking into consideration environmental and economic sustainability

PO8. **Ethics:** Follow ethical principles and norms in engineering practice

PO9. **Individual and Team work:** Function effectively as an individual, team member or leader in diversified environments

PO10. **Communication:** Communicate effectively through various modes for all engineering activities

PO11. **Project Management and Finance:** Apply Engineering knowledge and management principles for effective project management in multi-disciplinary environments

PO12. **Life-long Learning:** Engage in independent life-long learning and skill development for professional and social well being

7 COURSE CURRICULUM AND SYLLABUS

REGULATION 2016

Curriculum and Syllabus for B.E Computer Science and Engineering

SEMESTER I

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16ENT11	Communication Skills- I	2	0	2	3	100
16MAT14	Engineering Mathematics – I	3	2	0	4	100
16PHT14	Engineering Physics	3	0	0	3	100
16GET16	Fundamentals of Computing and Programming	3	0	2	4	100
16GET17	Basics of Electrical & Electronics Engineering	3	0	0	3	100
PRACTICAL						
16PHL11	Engineering Physics Laboratory	0	0	4	2	100
16EPL12	Engineering Practices Laboratory (Electrical, Electronics, Civil and Mechanical)	0	0	4	2	100
16PSL12	Sports for Wellness	0	0	2	1	100
	TOTAL	**14**	**2**	**14**	**22**	**800**

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
16ENT21	Communication Skills- II	2	0	2	3	100
16MAT24	Engineering Mathematics – II	3	2	0	4	100
16PHT24	Material Science	3	0	0	3	100
16GET26	C Programming	3	0	0	3	100
16GET27	Basics of Civil & Mechanical Engineering	3	0	0	3	100
PRACTICAL						
16CPL21	C Programming Laboratory	0	0	4	2	100
16EGL21	Engineering Graphics	1	0	4	3	100
16PSL22	Promotion of Students Wellness	0	0	2	1	100
	TOTAL	**15**	**2**	**12**	**22**	**800**

SEMESTER I

Course Code: 16ENT11	**Course Title: COMMUNICATION SKILLS I** (Common to all B.E/B.Tech Programmes)
Core/Elective: Core	**L : T : P : C : M** - 2: 0 : 2 :3 : 100
Type: Lecture & Practical	**Total Contact Hours:** 60

Prerequisites:

The student should have undergone English as his/her first or second language in school.

Course Outcomes

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

CO1. Listen to conversations, comprehend and answer questions equivalent to BEC preliminary listening exercises.
CO2. Answer questions about one-self and business-related themes on par with BEC preliminary speaking tests.
CO3. Read passages, infer and respond to the questions from BEC preliminary reading exercises.
CO4. Write appropriate business e mail, note, memo and letter on par with BEC preliminary writing tests.
CO5. Write simple and grammatically correct sentences.

Course Content

UNIT I LISTENING 12

Short conversations/monologues - numbers and spelling (dates, prices, percentages, figures, etc.) - and locate specific information - longer monologue and guided note taking - gap filling - Understanding the gist and extracting the main idea.

UNIT II SPEAKING 12

Answering questions about oneself, agreeing and disagreeing, expressing preferences - mini-presentation on a business theme (Oral) - Giving information and expressing opinions - discussion on business related topics – initiate a conversation and respond appropriately -business vocabulary - collocation.

UNIT III READING 12

Read short texts and understand the main message (signs, messages, postcards, notes, emails, labels) - Read and find specific information - Interpreting visual information - Comprehend detailed factual information - gather gist –cloze test

UNIT IV WRITING 12

Internal written communication - short messages to colleagues -note, message, memo, email- External communication -letter, email, notice - set phrases for letters and e-mails- Discourse markers, sign post words.

UNIT V GRAMMAR 12

Types of sentences – Declarative, interrogative, imperative and exclamatory – Usage of tenses (Simple and continuous forms) - Voices – Concord (Subject and verb) - Auxiliary - Infinitive and Gerunds –Article - Preposition - Comparative and superlative adjectives.

TEXT BOOKS:

1. Whitby Norman, "Business Benchmark Pre-intermediate to Intermediate Students Book", CUP Publications, Second Edition, 2014.
2. Wood Ian, Williams Anne, Cowper Anna, " Pass Cambridge BEC Preliminary", Cengage Learning, Second Edition, 2015.

REFERENCES:

1. "BEC-Preliminary - Cambridge Handbook for Language Teachers",CUP, Second Edition, 2000
2. Hewings Martin, "Advanced Grammar in use - Upper-intermediate Proficiency", CUP, Third Edition, 2013.

WEB REFERENCES

1. www.cambridgeenglish.org/exams/business/business-preliminary/
2. http://www.pearsonlongman.com/intelligent_business/bec_tests/preliminary.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									1	3		2
CO2									2	3		1
CO3									1	3		2
CO4									1	3		2
CO5									2	3		1

Course Code: 16MAT14	**Course Title:** ENGINEERING MATHEMATICS - I (FOR B.E CSE only)
Core/Elective: Core	**L : T : P : C : M** – 3 : 2 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 75

Course Outcomes

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

CO1. Calculate Eigen values and Eigen vectors for a given real matrix.
CO2. Use different testing methods to check the convergence and divergence of infinite series.
CO3. Apply the concepts of differentiation to curvature.
CO4. Identify the extreme values for two variable functions.
CO5. Apply multiple integrals to find area and volume.

Course Content

UNIT I EIGENVALUES AND EIGENVECTORS 9+6

Solution of system of equations-Eigenvalues and Eigenvectors of a real matrix- Characteristic equation- Properties of eigenvalues and eigenvectors- Diagonalization of matrices by orthogonal transformation- Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II SEQUENCES AND SERIES 9+6

Sequences: Definition and examples- Series: Types and Convergence- Series of positive terms-Tests of convergence: Comparison test, Cauchy's root test, Integral test and D'Alembert's ratio test –Alternating series- Leibnitz's test- Series of positive and negative terms- Absolute and conditional convergence.

UNIT III DIFFERENTIAL CALCULUS 9+6

Curvature- Cartesian and polar coordinates- Radius and Centre of curvature-Circle of curvature-Involutes and Evolutes-Envelopes.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9+6

Partial derivatives- Homogeneous functions and Euler's theorem- Total derivative- Change of variables- Jacobians- Partial differentiation of implicit functions – Taylor's series for functions of two variables –Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS 9+6

Double integration-Cartesian and polar coordinates-Change of order of integration-Transformation from Cartesian to polar, spherical and cylindrical coordinates-Triple integration in Cartesian Coordinates-Applications: Evaluating area and volume using multiple integrals.

TEXT BOOKS:

1. Srimanta Pal & Subodh C. Bhunia, "Engineering Mathematics", First Edition, 2015, Oxford University Press.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Tenth Edition,2015, Wiley India.

REFERENCES:

1. Peter V. O'Neil, "Advanced Engineering Mathematics", Seventh Edition,2012, Thomson Nelson, Toronto.
2. K.A. Stroud & Dexter J. Booth, "Advanced Engineering Mathematics", Fifth Edition,2011, Palgrave Macmillan.

WEB REFERENCE

1. http://nptel.ac.in/video.php?subjectId=122107036

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3										2

Course Code: 16PHT14	**Course Title:** ENGINEERING PHYSICS (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 3 :0 :0:3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes

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

CO1. Explain the properties of light and colors for electronic display devices
CO2. Illustrate the characteristics, principles and applications of laser
CO3. Explain the mode of propagation and attenuation in optical fibers
CO4. Identify a suitable technique for fabricating integrated circuits (ICs)
CO5. Describe the concept of luminescence in various electronic display devices

Course Content

UNIT I LIGHT **9**

Nature of Light- Laws of reflection and refraction - Dispersion- Interference - Diffraction - Mono chromatic light- Dispersion and combining white light- Colors - Primary and secondary colors – Color addition and subtraction - The electromagnetic spectrum- properties of electromagnetic radiation. Quantum concepts: Properties of matter waves- de Broglie wave equations.

UNIT II LASERS **9**

Laser principles: Stimulated and spontaneous emissions of radiations - Population inversion and pumping methods- Properties of lasers - Nd: YAG laser and CO_2 molecular laser - Semiconductor laser (Homo junction and hetro junction) - Holograms and Holographic data storage (record/read).

UNIT III FIBER OPTICS **9**

Optical fibers - Propagation of light through optical fibers -Expressions for numerical aperture and acceptance angle -Types of optical fibers based on material, refractive index, and mode of propagation- Losses in optical fiber - Attenuation- Bending and reflection losses- Photo detectors: PN, PIN & Avalanche photo diodes- Fiber optic communication link.

UNIT IV INTEGRATED CIRCUITS (ICs) **9**

Advantages of Integrated circuits (ICs) over discrete components- IC classification- Basic plannar processes – Silicon wafer preparation- Epitaxial growth & Oxidation- Photolithography- Diffusion – Isolation, base and emitter diffusion - Aluminium metallization – IC Assembly processing and packaging.

UNIT V DISPLAY DEVICES **9**

Optical Emissions: Luminescence, photoluminescence, cathodoluminescence- electroluminescence -Injection electro Luminescence- Working principles of displays: Plasma display, LED display, Liquid crystal display (LCD) and Numeric display.

TEXT BOOKS:

1. Gilbert Rowell, Sydney Herbert, "Physics", Cambridge University Press, 2008.(Unit 1)
2. M. N. Avadhanulu and P. G. Kshirsagar, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2013.(Unit 2, 3and 4)
3. David Armitage "Introduction to Micro displays", John Wiley & Ltd, 2006.(Unit 5)

REFERENCES:

1. R.K. Gaur, S.L. Gupta, "Engineering Physics", DhanpatRai Publications, 2013.
2. A. Marikani "Engineering Physics", Second Edition, PHI Learning, New Delhi, 2014.
3. Arthur Beiser, "Modern Physics", Tata McGraw-Hill Co, New Delhi, 2003.
4. David Halliday, Robert Resnick, Jearl Walker, "Fundamentals of Physics Extended", Ninth Edition, Wiley India, 2014.
5. D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", Third Edition New Age International Pvt. Ltd, 2010.

WEB REFERENCES

1. http://nptel.ac.in/syllabus/syllabus.php?subjectId=115103034
2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=115104041
3. http://nptel.ac.in/courses/115102025/
4. http://www.slideshare.net/ManojHarsule/display-devices-crt-and-lcd-screen
5. http://educypedia.karadimov.info/library/Display%20Technology%20Overview.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	2										2
CO3	3	2										2
CO4	3	1										3
CO5	3	1										3

Course Code: 16GET16	Course Title: FUNDAMENTALS OF COMPUTING AND PROGRAMMING (Common to CSE and IT)
Core/Elective: Core	L : T : P : C : M – 3 :0 :2: 4 : 100
Type: Lecture	Total Contact Hours:75

Course Outcomes

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

CO1. Develop flow charts for simple problems
CO2. Comprehend the process of language independent program development
CO3. Construct programs using suitable selection and repetition structures
CO4. Solve searching and sorting problems using arrays
CO5. Create modular programs using functions

Overview of Engineering Education (Not included for assessment) **3**

Expectation and Aspirations of engineering students, Graduate Engineering Attributes, Outcome based Engineering Curriculum, Engineering Skills – Technical and Professional. Courses, Course map, Concepts and Theories of Learning – Higher order Thinking Skills, Multiple Intelligences.

Course Content

UNIT I INTRODUCTION TO PROGRAMMING **8**

Introduction to Programming: General Problem Solving Strategy, Program Development Cycle - Basic Programming Concepts: A Simple Program, Data Input, Program Variables and Constants - Data Types - Data Processing and Output - Case Study: RAPTOR

UNIT II PROGRAM DEVELOPMENT AND SELECTION STRUCTURES **8**

Process of Developing a Program - Program Design - Coding, Documenting, and Testing a Program - Structured Programming - Types of Selection Structures - Relational and Logical Operators - Applications of Selection Structures

UNIT III REPETITION STRUCTURES **8**

Introduction to Repetition Structures - Types of Loops - For Loop - Combining Loops and Selection Structures - Nested Loops - Applications of Repetition Structures

UNIT IV ARRAYS, SORTING AND SEARCHING **9**

Introduction to Arrays - One Dimensional Arrays - Arrays Declaration, Strings as Arrays of Characters - Two-Dimensional Arrays - Introduction to Sorting and Searching - Bubble Sort Technique - Binary Search - Applications of Arrays

UNIT V FUNCTIONS **9**

Introduction to Arguments and Parameters - Subprograms: Value and Reference Parameters - Difference between Value and Reference Parameters- Scope of a Variable - Functions: Built-in Functions - User Defined Functions - Applications of Functions

LAB COMPONENT

30

Students must develop programs for any two problems (not limited to the list) in each category using RAPTOR / SCRATCH tools.

1. Experiments using MS-Office package
   i. Create resume using MS-Word
   ii. Generation of mark sheet of a student using MS-Excel
   iii. Generation of Electricity Bill using MS-Excel
   iv. Create presentation for Product Marketing

2. Programs using Fundamental Algorithms
   v. Exchanging the values of Two Variables
   vi. Counting, Summation of a set of Numbers
   vii. Factorial Computation
   viii. Reversing the Digits of an Integer

3. Programs using Factoring Methods
   i. Finding the square Root of a number
   ii. The Smallest Divisor of an Integer
   iii. The Greatest Common Divisor of Two Integers
   iv. Computing the n^{th} Fibonacci number

4. Programs using Array Techniques
    i. Array Order Reversal
    ii. Finding the Maximum Number in a Set
    iii. Removal of Duplicates from an Ordered Array
    iv. Finding the k^{th} Smallest Element

5. Programs using Sorting and Searching
    i. Bubble Sort
    ii. Selection Sort
    iii. Linear Search
    iv. Binary Search

6. Programs using Function
    i. Area of Circle
    ii. CGPA calculation
    iii. Simple Interest Calculation
    iv. Fibonacci Series

TEXT BOOKS:

1. Venit S, and Drake E, "Prelude to Programming Concepts and Design", Sixth Edition, Pearson Education, 2015
2. R.G. Dromey, "How to Solve it by Computer", Second Edition, Pearson Education, India, 2008. (For Lab Component)

REFERENCES:

1. Tony Gaddis, "Starting Out with Programming Logic and Design", Fourth Edition, Pearson Education, 2015
2. Majed Marji, "Learn to Program with Scratch", No Starch Press, 2014

WEB REFERENCES

1. http://raptor.martincarlisle.com/
2. https://scratch.mit.edu/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3		2							
CO2	2		1									
CO3	2	2	2		2							
CO4	3	2	2		2							
CO5	3	3	2		2							

Course Code: 16GET17	**Course Title:** BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 3 :0 :0:3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes

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

CO1. Apply basic laws to study simple DC circuits.
CO2. Comprehend basic AC circuits and their phasor representation.
CO3. Differentiate and specify electrical machines like motor, generator and transformer.
CO4. Identify suitable basic electronic and display devices for simple applications.
CO5. Categorize opto-electronic devices and transducers for real time entities**.**

Course Content

UNIT I FUNDAMENTALS OF DC CIRCUITS 9

Definition, Symbol and Unit of Quantities – Active and Passive elements – Ohm's law: statement, illustration and limitation – Kirchhoff's Laws- statement and illustration – Resistance in series and voltage division technique – Resistance in parallel and current division technique –Method of solving a circuit by Kirchhoff's laws – Star to Delta and Delta to Star transformation.

UNIT II AC FUNDAMENTALS 9

Magnetic circuits: Definition of magnetic quantities – Law of electromagnetic induction - Generation of single phase alternating EMF – Terminology – Concept of 3-Phase EMF generation – Root Mean Square – Average Value of AC – Phasor representation of alternating quantities – Pure resistive, inductive and capacitive circuits.

UNIT III ELECTRICAL MACHINES 9

DC generator and DC motor - Construction, Working Principle, Characteristics of shunt and series motor – Single phase Transformer: Construction, working principle – Three phase and single phase induction motor: Construction, Working Principle.

UNIT IV SEMICONDUCTOR DEVICES 9

Theory of semiconductor - PN junction diode, Forward Bias Condition, Reverse Bias Condition, V-I Characteristics–Bipolar Junction Transistor – Operation of NPN and PNP transistor, Types of configuration - Common Emitter– Field Effect Transistor: Construction and operation of N - channel Junction Field Effect Transistor**.**

UNIT V DISPLAY DEVICES AND TRANSDUCERS 9

Opto - Electronic Devices – Working principles of photo conductive cell, photo voltaic cell, solar cell – Display Devices – Light Emitting Diode, Liquid Crystal Display - Transducers: Capacitive and Inductive transducer, Thermistors, Piezoelectric and Photoelectric transducer.

TEXT BOOK:

1. Muthu Subramanian. R & Salivahanan.S, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill Limited, New Delhi, 2009.

REFERENCES:

1. William D.Stanley, John R. Hackworth, Richard Lones, "Fundamentals of Electrical Engineering and Technology", Thomson Delmar Learning, 2007.
2. Theraja.B.L and Theraja.A.K, "A Text book of Electrical Technology", (Volume I and II), S.Chand and Company Ltd., New Delhi (India), 2001.
3. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, New York (US), 2001.

WEB REFERENCES

1. www.auupdates.com/
2. www-inst.eecs.berkeley.edu/
3. https://www.cengagebrain.co.nz/
4. www.allaboutcircuits.com
5. www.electrical4u.com

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					1	2					
CO2	3					1	2					
CO3		2				1						
CO4	3	2				1						
CO5	3	2				1						

Course Code: 16PHL11	**Course Title:** ENGINEERING PHYSICS LABORATORY (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 0 :0 :4:2 : 100
Type: Laboratory	**Total Contact Hours:** 60

Course Outcomes

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

CO1: Measure optical parameters of Light, Laser and optical fiber.
CO2: Estimate electrical properties of metal and semiconductor.
CO3: Evaluate magnetic properties of a soft magnetic material.

Course Content

LIST OF EXPERIMENTS

1. Air wedge- Thickness of thin material
2. Determination of wavelength of Laser light – Laser diode
3. Determination of particle size of given powder using Laser diode
4. Determination of Acceptance angle and Numerical aperture of an optical fiber – Laser diffraction method
5. Determination of band gap of semi conducting materials – Thermistor (Germanium)
6. Determination of specific resistance of a given wire - Carey Foster's Bridge
7. Determination of thermal conductivity of bad conductor- Lees disc method
8. Light Illumination characteristics of Light dependent resistor (LDR)
9. Current- Voltage characteristics of semiconductor solar cell
10. To study the truth tables of various basic logic gates (AND, OR, NOT, NAND, NOR)
11. Magnetic hysteresis- Determination of Hysteresis losses in a ferromagnetic material.
12. Conductivity, Resistivity – Four Probe method

REFERENCES

1. Dr. Jayaraman, V.Umadevi, S.Maruthamuthu & B. Saravanakumar, "Engineering Physics Laboratory Manual", Pearson Publishers, New Delhi, 2014.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										3
CO2	3	2										3
CO3	3	2										3

Course Code: 16EPL12	**Course Title:** ENGINEERING PRACTICES LABORATORY (Common to CSE, ECE, EEE, EIE and IT)
Core/Elective: Core	**L : T : P : C : M** – 0 :0 :4:2 : 100
Type: Practical	**Total Contact Hours:** 60

Course Outcomes:

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

CO1. Draw the basic symbols of Electrical and Electronic components and identify the elements.

CO2. Execute soldering practice for electrical and Electronics circuits.

CO3. Verify basic laws and demonstrate basic wiring.

CO4**.** Demonstrate the basic plumbing, carpentry, fitting, sheet metal and welding operations.

CO5. Demonstrate the hand forging and sand moulding process.

LIST OF EXPERIMENTS

Electrical & Electronics: 30

1. Symbols of Electrical and Electronic components.
2. Identification of Resistor and Capacitor Values.
3. Soldering practice of simple circuits and checking the continuity.
4. Verification of Ohms law.
5. Verification of Kirchhoff's current & voltage law.
6. Fluorescent tube, Stair case and House wiring

Civil & Mechanical: 30

1. Make a wooden Tee joint to the required dimension.
2. Assemble the pipeline connections with different joining components for the given layout.
3. Make a tray in sheet metal to the required dimension.
4. Make a "V" fitting to the required dimension using fitting tools.
5. Weld a butt joint using welding process to the required dimension.
6. Demonstration on hand forging and sand moulding process.

REFERENCES:

1. Jeyachandran.K, Natarajan.S. & Balasubramanian.S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Rajendra Prasad. A &Sarma.P.M.M.S, "Workshop Practice", SreeSai Publication, 2002.
3. Kannaiah.P&Narayana.K.L, "Manual on Workshop Practice", Scitech Publications, 1999.
4. MCET - Engineering Practices Laboratory Manual.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			3	2					3			2
CO2			3			2			3			2
CO3	3	3	2	2					3			
CO4	1	1		1	1							
CO5	1	1			1							

Course Code: 16PSL12	Course Title: SPORTS FOR WELLNESS (Common to CSE, ECE and IT)
Core/Elective: Core	L : T : P : C : M – 0 :0:2:1 : 100
Type: PS	Total Contact Hours: 30

Course Outcomes

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

CO1. Explain the significance of physical fitness for healthy living
CO2. Maintain physical fitness through exercises
CO3. Exhibit mental agility

UNIT I HEALTH

Meaning of health - Components of health - physical, mental, social, emotional, spiritual -importance of health - Personal hygiene - Heredity and environment –Adopting healthy habits

UNIT II FITNESS& WELLNESS

Fitness and wellness – What is physical fitness - categories - components of health related physical fitness- components of skill related physical fitness-values of physical fitness – Physical fitness development. What is wellness - importance of wellness for engineers –factors promoting wellness – Physiology and health : cardio-respiratory, muscular and nervous systems – ageing

UNIT III FOOD& HEALTH

Energy balance and body composition – nutrients- problems of surplus and deficiency- balanced diet - good food habits for better health – hazards of junk food - food and the gunas.

UNIT IV FITNESS & DEVELOPMENT I

Exercises related ailment and injuries - safety and precautions - first aid.
Muscular strength – exercises (calisthenics): pull-up, sit-up, push-up and weight training.
Explosive power – exercises: vertical jump, long jump, Cardio respiratory endurance– exercises: walking, jogging, treadmill, stair climbing, bicycling, skipping. Flexibility –exercises: stretching

UNIT V FITNESS & DEVELOPMENT II

Speed, agility, balance and coordination – exercises: sprint, cone drill, ladder drill, hurdle drill, ball throw - mental agility tests. Dexterity - 12 minutes cooper test – long run – adventure games
Team games.

REFERENCES

1. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).
2. Student reading material and workbook prepared by PS team of the college.

OPERATIONAL MODALITIES:

Orientation programme

Special lectures by invited resource persons at semester beginning
3 lectures x 4 hours = 12 hours

Follow-up practice

12 weeks x 2 hours/week = 24 hours

Evaluation

Continuous evaluation:

Physical Exercises		= 40 marks
Assessment of students workbook		= 20 marks
	Total	= 60 marks

Semester end examination:

Written test (MCQ and short answers)		= 30 marks
Physical exercises		= 50 marks
Viva-voce		= 20 marks
	Total	= 100 marks

End semester mark out of 100 is reduced to 40 marks

The student should get a total of 50 marks put together for a pass.

MEASUREMENTS: At the Beginning + At Semester End
SCHEDULE OF EXERCISES FOR STUDENTS WITH DIFFERENT PHYSICAL CONDITIONS

Underweight	Normal	obese
Flexibility exercises - stretching	Flexibility exercises - stretching	- Brisk walking
Minor games -forward running relay -backward running relay - over & under relay -circle games, etc.	- Walking - Walking-cum-jogging	- Minor games
Strength Training - Calisthenics	Cardio/Functional Fitness - Skipping - Stair climbing - jogging - bicycling - long distance running	flexibility exercises - stretching - Cycling (static)
Cardio/Functional Fitness - Skipping - Stair climbing - jogging - bicycling	Agility - ladder drills - hurdle drill - cone drill	Cardio/Functional Fitness Skipping Jogging bicycling
Agility exercises - ladder drills - hurdle drill - cone drill	Strength Training -Calisthenics -gym workout for major muscles	Strength Training - Calisthenics - gym workouts
Diet Considerations	Diet considerations	Diet considerations
Measurements		
BMI Hand grip strength test 12 m Cooper run Sit & reach	BMI 12 m Cooper run Sit & reach test Illinois agility test	BMI Body fat percentage Waist-to-hip ratio Sit & reach

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									3			2
CO2									3			2
CO3									3			2

END OF SEMESTER I

***

SEMESTER II

Course Code: 16ENT21	**Course Title:** COMMUNICATION SKILLS II (Common to all B.E/B.Tech Programmes)
Core/Elective: Core	**L : T : P : C : M** - 2 : 0 :2 :3 : 100
Type: Lecture & Practical	**Total Contact Hours: 60**

Prerequisites:

The student should have undergone 60 hours of communication skills I training

Course Outcomes

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

CO1. Listen to monologues or dialogues, comprehend and answer questions equivalent to BEC vantage listening exam
CO2. Speak about oneself and business-related themes on par with BEC vantage speaking exam
CO3. Read business correspondences, infer and respond to the question similar to BEC vantage reading exam
CO4. Write appropriate business e mail, memo, proposal, report and letter on par with BEC vantage writing exam
CO5. Write error free sentences using advanced grammatical elements

Course Content

UNIT I LISTENING 12

Listening to monologues or dialogues and noting specific information - Listening to identify topic, context, and function - Listening for details and main ideas - Gap filling and matching multiple choice questions.

UNIT II SPEAKING 12

Giving personal information -Talking about present circumstances, past experiences and future plans, expressing opinions, speculating - mini-presentation on a business theme - Giving information and expressing and justifying opinions - discussion on a business-related topic - Expressing and justifying opinions, speculating, comparing and contrasting, agreeing and disagreeing, etc.

UNIT III READING 12

Reading - scanning for gist and specific information (Newspaper and magazine articles, reports, advertisements, letters, messages, brochures, guides, manuals) - Reading and understanding text structure – Comprehension – Reading for vocabulary and structure - understanding sentence structure and finding errors.

UNIT IV WRITING 12

Internal written communication - Writing a message, memo or an email: giving instructions, explaining development, asking for comments, requesting information, agreeing to requests - External Communication (e.g. explaining, apologizing, reassuring, complaining), reports (e.g. describing, summarizing) or proposals (e.g. describing, summarizing, recommending, persuading).

UNIT V GRAMMAR 12

Reportedspeech – Conditionals – Modals - common errors - cohesive devices.

TEXT BOOK:

1. Whitby Norman, "Business Benchmark Upper Intermediate Students Book", CUP Publications, Second Edition, 2014

REFERENCES:

1. "Cambridge BEC Vantage - Practice Tests, Self-study Edition", Cambridge University Press, 2002
2. Hewings Martin, "Advanced Grammar in use - Upper-intermediate Proficiency", CUP, Third Edition, 2013

WEB REFERENCES

1. www.cambridgeenglish.org/exams/business.../business-preliminary/
2. http://www.examenglish.com/BEC/BEC_Vantage.html
3. www.splendid-speaking.com/exams/bec_speaking.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									1	3		2
CO2									2	3		1
CO3									1	3		2
CO4									1	3		2
CO5									2	3		1

Course Code: 16MAT24	Course Title: ENGINEERING MATHEMATICS-II (FOR B.E CSE only)
Core/Elective: Core	L : T : P : C : M – 3 : 2 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 75

Prerequisites: The student should have undergone the course(s):

- Engineering Mathematics I

Course Outcomes

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

CO1. Compute the Fourier series expansion for given periodic functions
CO2. Calculate the Fourier transform of an aperiodic function.
CO3. Understand the basic concepts of vector spaces.
CO4. Apply inner product of vectors to produce an orthonormal basis.
CO5. Apply the concept of diagonalization in singular value decomposition of a matrix

Course Content

UNIT I FOURIER SERIES **9+6**

Fourier series–Dirichlet's condition– Half range sine and cosine series –Parseval's identity– Harmonic Analysis.

UNIT II FOURIER TRANSFORMS **9+6**

Fourier transforms– Fourier Cosine and Sine transforms – Inverse transforms –Convolution theorem and Parseval's identity for Fourier transforms

UNIT III VECTOR SPACES **9+6**

Vector spaces – Subspace of a vector space – basis and dimension of vector space – linear combination and spanning sets of vectors – linear independence and linear dependence of vectors – Row space, Column space and Null space – Rank and nullity of subspaces –Inner product of vectors: length of a vector, distance between two vectors.

UNIT IV ORTHOGONALITY AND INNER PRODUCT SPACES **9+6**

Orthogonality of vectors–Orthogonal projection of a vector–Gram-Schmidt process to produce orthogonal and orthonormal basis –Inner product spaces–Fourier approximation of continuous functions using inner product spaces

UNIT V SYMMETRIC MATRICES AND QUADRATIC FORMS **9+6**

Diagonalization of symmetric matrices –Spectral Theorem – Spectral Decomposition – Quadratic forms – Constrained Optimization–Singular Value Decomposition

TEXT BOOKS:

1. Srimanta Pal &Subodh C. Bhunia, "Engineering Mathematics", First edition, 2015, Oxford University Press.
2. David C. Lay, "Linear algebra and its Applications", Fifth Edition, 2016, Pearson Education.

REFERENCES:

1. Peter V. O'Neil, "Advanced Engineering Mathematics", Seventh Edition, 2012, Thomson Nelson, Toronto.
2. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Eleventh Edition John Wiley & Sons, 2014.

WEB REFERENCES

1. http://www.nptel.ac.in/courses/117101055/downloads/Lec-15.pdf
2. http://nptel.ac.in/courses/111106051/
3. http://nptel.ac.in/downloads/111102011/
4. http://nptel.ac.in/downloads/111108066/
5. http://nptel.ac.in/courses/111103021/15

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3										2

Course Code: 16PHT24	**Course Title:** MATERIAL SCIENCE (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 3 :0 :0:3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes

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

CO1. Interpret the fundamental behavior of conduction in materials
CO2. Explain the nature of semiconductors
CO3. Explain the functioning of semiconductor devices
CO4. Choose suitable magnetic and dielectric material for specific engineering application

Course Content

UNIT I CONDUCTING MATERIALS **9**

Basics of electrical conduction- Current density- Mobility - Classical free electron theory of metals - Derivation for electrical and thermal conductivity- Wiedemann Franz law- Draw backs of Classical free electron theory- Sources of resistivity – Low and high resistive materials

UNIT II SEMICONDUCTING MATERIALS **9**

Classification of solids based on band gap - Properties of semi conducting materials -Covalent bond in semiconductors (Ge, Si)- Intrinsic and extrinsic semiconductors- Expression for carrier concentration (n type) - Variation of carrier concentration and fermi level with temperature - Hall Effect – Determination of Hall coefficient- Applications: Hall multiplier-Hall effect sensor.

UNIT III SEMICONDUCTING DEVICES **9**

PN junction diode – Forward bias – Reverse bias – Bi polar junction transistors- Common emitter (CE) configuration and characteristics - JFET and characteristics - Metal oxide semiconductor field effect transistor (MOSFET) and characteristics.

UNIT IV MAGNETIC MATERIALS **9**

Introduction to magnetic materials – Origin of magnetic moment – Properties of dia, para, ferro, antiferro and ferri magnetic materials - Domain theory of ferromagnetism - Hysteresis – Properties of hard and soft magnetic materials - Applications of magnetic materials: Magnetic hard disc, Memory sticks, smart card and flash cards.

UNIT V DIELECTRIC MATERIALS **9**

Classification of dielectric materials- Dielectric constant - Polarization – Electronic, ionic, orientation and space charge polarization –Internal field- Claussius mosotti relation- Frequency and temperature dependence of polarization- Dielectric loss- Dielectric breakdown- Applications : Capacitors, transformers, and capacitive touch screens.

TEXT BOOKS:

1. Avadhanulu M.N. and Kshirsagar P G, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2013.
2. S.O. Kasap, "Principles of Electronics Materials and Devices", McGraw Hill Higher Education, New Delhi, 2006.

REFERENCES:

1. A. Marikani "Engineering Physics", 2nd Edition, PHI Learning, New Delhi, 2014.
2. William D Callister, "Fundamentals of Materials Science and Engineering**:** An Integrated Approach", John Wiley and Sons Inc., 6th Edition, New York, 2012.
3. V Rajendran, "Engineering Physics", Tata McGraw-Hill Co, New Delhi, 2009.

WEB REFERENCES

1. http://nptel.ac.in/courses/115102026/2
2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=115103029
3. http://nptel.ac.in/courses/115102014/
4. http://nptel.ac.in/syllabus/syllabus.php?subjectId=115103029
5. http://www.physicscentral.com/
6. http://www.physicsclassroom.com/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	2										2
CO3	3	2										3
CO4	3	2										2

Course Code: 16GET26	**Course Title**: C PROGRAMMING (For CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 3 :0 :0:3 : 100
Type: Lecture	**Total Contact Hours**: 45

Prerequisite:

- Fundamentals of Computing and Programming

Course Outcomes

At the end of the course students will be able to

CO1. Choose and specify appropriate programming constructs
CO2. Construct programs using arrays and pointers
CO3. Write programs using strings and functions
CO4. Apply the concepts of structures and unions
CO5. Develop programs using preprocessor directives and Files

Course Content

UNIT I DATA TYPES, OPERATORS AND STATEMENTS 9

Overview of C – C Character set - Identifier and keywords - Data types –Storage classes- typedef – Type Casting - Variables and Constants –Structure of C program – Executing a C program - Operators and Expressions – Statements: Input and Output statements –Decision Making - Branching and Looping

UNIT II ARRAYS AND POINTERS 9

Arrays: Declaration – Initialization –Single dimensional arrays- Multidimensional arrays– Dynamic memory allocation- Pointers: Declaration of Pointer variable - Operations on Pointers - Relationship between Arrays and Pointers – Array of Pointers – Pointer to a Pointer – Pointer to an Array .

UNIT III STRINGS AND FUNCTIONS 9

Strings: Character arrays –Reading string input - String library functions – List of strings functions-Functions: Types - Declaration - Definition - Function call - Returning functions – Pass by value – Pass by reference – Passing arrays to functions– Recursion - Pointer to function

UNIT IV STRUCTURES AND UNION 9

Structure: Definition – Declaration – Operations on Structures –Pointer to Structures -Array of Structures - Structure within a Structure —Functions and Structures – Union: Definition - Declaration – Operations on Union – Enumerations – Bit-Fields

UNIT V PREPROCESSOR DIRECTIVES AND FILES 9

Preprocessor Directives: Types – Macros – File inclusion - Conditional compilation directives - Files: Streams – I/O using Streams – File type - File operations - Command line arguments – Graphics functions.

TEXT BOOK:

1. Ajay Mittal "Programming in C- A practical Approach", Pearson Education, 2015.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
2. Stephen G. Kochan "Programming in C", Fourth Edition, Addison Wesley Publishing, August 2014.
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
4. K.N.King, "C Programming A modern Approach", Second Edition, W.W.Norton and Company, 2008.
5. E.Balagurusamy, "Programming in ANSI C ", Sixth Edition, Tata McGraw Hill, 2012.

WEB REFERENCES

1. http://www.cprogramming.com/
2. http://www.tutorialspoint.com/cprogramming/
3. http://www.c4learn.com/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3						3	3	3	
CO2	3	3	3	2	1			3	3	3	3	3
CO3	3	3	3	2	1				2	3	3	3
CO4	2	2	2						2	2	2	3
CO5	2	2	2		3			2	2	2	2	3

Course Code: 16GET27	**Course Title:** BASICS OF CIVIL AND MECHANICAL ENGINEERING (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 3 :0 :0:3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes

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

CO1. Select the best material and suitable foundation for the required construction.
CO2. Impart basic knowledge about the components of structures.
CO3. Explain the various alternate sources of energy and components of a power plant.
CO4. Explain different manufacturing processes like casting, forming, welding and machining operations.
CO5. Discuss the construction and working of IC engines and refrigerators.

Course Content

UNIT I CIVIL ENGINEERING MATERIALS AND BUILDING COMPONENTS 9

Scope of Civil Engineering - Functions of civil Engineer and Basic areas in Civil Engineering. Civil Engineering Materials and their properties: - Stones, bricks, sand, aggregate, cement, steel, concrete and Reinforcement cement concrete.
Sub structure: - Bearing capacity of soil – Problems with soil – Type of foundation - Selection of foundation based on soil conditions – Requirement of good foundation – Various types of foundations.

UNIT II BUILDING COMPONENTS, HIGHWAY AND RAILWAY ENGINEERING 9

Super structure: - Vertical Components such as brick masonry walls, stone masonry walls and columns – Horizontal components such as Beam, Lintels, sun shades – various types of roofs and floors. Highway and Railway Engineering: - Importance of transportation networks-classification of highways-Railway Engineering and its components- Classification of Bridges.

UNIT III ALTERNATE SOURCES OF ENERGY, POWER PLANTS AND BOILERS 9

Types of Boilers –Simple Vertical, Babcock and Wilcox and La-Mont Boiler, Differences between fire tube and water tube boiler. Types of steam turbines- working of a single stage impulse and reaction turbines. Power Plant: Classification of Power Plants- Steam - Nuclear, Diesel, and Hydro Power Plants. Solar, Wind, Tidal, Geothermal and Ocean Thermal Energy Conversion (OTEC).

UNIT IV MANUFACTURING PROCESSES 9

Metal Casting-Foundry–Moulding and Casting Processes, Metal Forming, Forging, Rolling, Extrusion processes. Metal joining processes - Welding, Metal machining–Turning, Milling, Drilling, Shaping - 3D printing.

UNIT V THERMAL ENGINEERING 9

Refrigeration -Principle of vapour compression system – Layout of typical domestic refrigerator, Refrigerants–types and properties. Air conditioning–definition, working principle of window and Split type room air conditioners. Internal combustion engines–Working principle of Petrol and Diesel Engines–Two stroke and Four stroke cycles–Comparison of two stroke and four stroke engines.

TEXT BOOKS:

1. Jayagopal.L.S, Rudramoorthy.R, "Elements of Civil and Mechanical Engineering", Vikas Publishing House, New Delhi,2010.
2. Shanmugam.GandPalanichamy.M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., NewDelhi,1996

REFERENCES:

1. Bindra.S.P and Arora.S.P, "The text book of Building construction", Dhanpat Rai Publications(P) Ltd., NewDelhi,2011.
2. Ananthanarayanan.P, "Basic Refrigeration and Air Conditioning", Tata Mc Graw HilI Publishing Co., New Delhi,2003.
3. Srinivasan.S,"Automotive Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2003.

WEB REFERENCES

Civil

1. http://nptel.ac.in/courses/105102088/2
2. http://nptel.ac.in/course.php?disciplineId=105

Mechanical

1. www.electrical4u.com/steam-boiler-working-principle-and-types-of-boiler/
2. www.thelibraryofmanufacturing.com/
3. https://www.swtc.edu/ag_power/air_conditioning/.../basic_cycle.htm

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1			1							
CO2	1	1		1	1							
CO3	2	1	1	1	1	1						
CO4	2	1	1	1	1	1						
CO5	2	1	1	1	1	1						

Course Code: 16CPL21	**Course Title:** C PROGRAMMING LABORATORY (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 0 :0 :4:2 : 100
Type: Practical	**Total Contact Hours:**60

Course Outcomes

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

CO1. Use different operators, formatting input and outputs in designing a program.
CO2. Design programs involving decision making, loops and functions
CO3. Develop programs to demonstrate the usage of arrays and pointers.
CO4. Construct programs using advanced features like preprocessor directives, macros, files and graphics.

Course Content

LIST OF EXPERIMENTS

1. Program to process data types, operators and expression evaluation.
2. Program using formatting inputs and outputs.
3. Program using decision making and looping Statements
4. Program using arrays and pointers
5. Program for string manipulation
6. Program using functions
7. Program using structures and union
8. Program using preprocessor directives and macros
9. Program on basic file operations
10. Program using graphics functions.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.
2. Stephen G. Kochan "Programming in C", Fourth edition, Addison Wesley Publishing, August 2014.
3. E.Balagurusamy, "Programming in ANSI C", Sixth Edition, Tata McGraw Hill, 2012.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1					2	2		3
CO2	3	2	3	3	3	1		3	3	3	2	3
CO3	3	3	3	3	3	2		3	3	3	3	3
CO4	3	3	3	3	3	2		3	3	3	3	3

Course Code:16EGL21	**Course Title:** ENGINEERING GRAPHICS (Common to CSE and IT)
Core/Elective: Core	**L : T : P : C : M** – 1 :0 :4:3 : 100
Type: Lecture& Practical	**Total Contact Hours:**75

Course Outcomes

At the end of the course, the students will be able to:
CO1. Sketch different curves and explain its application.
CO2. Prepare orthographic projection from pictorial views and models
CO3. Draw the projection of solids
CO4. Draw the projection of sectioned solids.
CO5. Draw the development of surfaces of simple solids with cuts and slots**.**

Course Content

UNIT I CURVES USED IN ENGINEERING PRACTICES ` 13

Application of curves in Engineering- Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloids and involutes of square and circle.

UNIT II ORTHOGRAPHIC PROJECTION 18

First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects-Orthographic projection of solids.

UNIT III PROJECTION OF SOLIDS 18

Projection of solids – Types of solids- Polyhedra and solids of revolution-Orthographic views of solids- Axis inclined to one reference plane.

UNIT IV SECTION OF SOLIDS 13

Sectional view -Types of section planes-True shape of section-Orthographic views of sectioned solids -Section plane inclined to one reference plane and perpendicular to the other.

UNIT V DEVELOPMENT OF SURFACES 13

Development of lateral surfaces of simple and truncated solids –Parallel line method - Radial Line method.

TEXT BOOK:

1. K. V. Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2013).

REFERENCES:

1. Dhananjay A. Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGrawHill Publishing Company Limited (2008).
2. Cencil Jensen, Jay D. Helsel and Dennis R. “Short Engineering Drawing and Design”, Tata McGraw Hill Publishing Company Limited (2012).

WEB REFERENCES

1 http://www.engineeringdrawing.org/
2 http://nptel.ac.in/
3 http://iitd.ac.in/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		3					3			2
CO2	3	3		3					3			2
CO3	2	2		3					2			2
CO4	2	2		1					2			1
CO5	1	1		1					1			1

Course Code: 16PSL22	Course Title: PROMOTION OF STUDENTS WELLNESS (Common to CSE, ECE and IT)
Core/Elective: Core	L : T : P : C : M – 0 :0 :2: 1 : 100
Type: PS	Total Contact Hours:30

Course Outcomes

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

CO1. Maintain physical wellbeing - grooming, BMI, flexibility, muscle strength, body compositions (vatha, pitha, kapa)
CO2. Maintain mental wellbeing - perceptions, attention/concentration, memory, gunas
CO3. Maintain social wellbeing - etiquettes, emotional and psychological aspects, stress management, morality and values

Course Content

UNIT I PHYSICAL HEALTH

Physical structure and functions of human body – simplified physical exercises (hand exercises, Leg exercises, breathing exercises, eye exercises – kapalapathi – Maharasanas 1-2 – Massages – Acupuncture – relaxation – importance and benefits. Suryanamaskar.

UNIT II MENTAL HEALTH

Maintenance of youthfulness and life force – kayakalpa yoga – anti ageing process – benefits. Mind and its functions – mind wave frequency – meditation process – Agna, shanthi, thuriam – benefits

UNIT III PERSONALITY DEVELOPMENT – I

Purpose of life and analysis of thought – philosophy of life – introspection – practice. Moralization of desires and neutralization of anger - practices

UNIT IV PERSONALITY DEVELOPMENT – II

Eradication of worries and benefits of blessings – wave theory –practices. Genetic centre – purification – cause and effect theory

UNIT V SOCIAL HEALTH

Greatness of guru – cultural education – love and compassion – fivefold culture.Greatness of friendship and social welfare – individual, family and world peace.

TEXT BOOK :

1. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar ,"Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, I Ed. (2010)

REFERENCES:

1. Dr.R.Nagarathna, Dr.H.R.Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.
2. Dr.R.Nagarathna, Dr.H.R.Nagendra , "New perspectives in stress management", Swami Vivekananda Yoga Prakashana, Bangalore, I Ed June 1986.

OPERATIONAL MODALITIES

Orientation programme

Theory and practice demonstration

3 days - 7 hours /day for syllabus coverage

Follow-Up Practice

12 weeks x 2 hours/week: 24 hours

Evaluation:

Continuous evaluation:

Physical Exercises, Kaya kalpa practice, meditation	= 40 marks
Introspection (assessment of students workbook)	= 20 marks
Total	= 60 marks

Semester end examination:

Written test (MCQ and short answers)	= 30 marks
Physical exercises, meditation	= 50 marks
Viva-voce	= 20 marks
Total	= 100 marks

End semester mark out of 100 is reduced to 40 marks

The student should get a total of 50 marks put together for a pass.

DIMENSIONS AND TOOLS IN MEASUREMENT

Dimension	Sub dimension	Measurement tools
Physical	BMI	Electronic Weighing Machine, Height Measurement
	Flexibility	Sit & Reach
	Muscle Strength	Handgrip Dynamometer
Mental	Perception	Critical Flicker Fusion
Social	Interpersonal Effectiveness & Self Concept	FIRO B
	Psychological Well Being	Short wellbeing scale
		Short Happiness scale
		Barrat Impulsive Scale

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									3			2
CO2						1		2	3			2
CO3						1		2	3			2

END OF SEMESTER II

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REGULATION 2014 (Revision 1)

Curriculum and Syllabus for B.E Computer Science and Engineering

SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141CS0301	Digital System Design	3	0	0	3	100
141CS0302	Engineering Mathematics –III	4	0	0	4	100
141CS0303	Principles of Communication Engineering	3	0	0	3	100
141CS0304	Operating Systems	3	0	0	3	100
141CS0305	Data Structures and Algorithm Analysis-I	3	0	0	3	100
141CS0306	Object Oriented Programming	3	0	2	4	100
PRACTICAL						
141CS0307	Data Structures and Algorithm Analysis-I Laboratory	0	0	4	2	100
141CS0308	Digital System Design Laboratory	0	0	4	2	100
141CS0309	Personal Effectiveness	0	0	2	1	100
	One Credit Course	0	0	2	1	100
	TOTAL	**19**	**0**	**14**	**26**	**1000**
LIST OF ONE CREDIT COURSES OFFERED						
PC Hardware and Trouble shooting						
Linux Shell Programming						

SEMESTER IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
141CS0401	Database systems	3	0	0	3	100
141CS0402	Probability and Queuing Theory	4	0	0	4	100
141CS0403	Computer Architecture	3	0	0	3	100
141CS0404	Software Engineering	3	0	0	3	100
141CS0405	Data Structures and Algorithm Analysis-II	3	0	0	3	100
141CS0406	Java Programming	3	0	2	4	100
PRACTICAL						
141CS0407	Data Structures and Algorithm Analysis-II Laboratory	0	0	4	2	100
141CS0408	Database systems Laboratory	0	0	4	2	100
141CS0409	Ethical and Moral Responsibility	0	0	2	1	100
	One Credit Course	0	0	2	1	100
	TOTAL	**19**	**0**	**14**	**26**	**1000**
LIST OF ONE CREDIT COURSES OFFERED						
PHP / MySQL						
Blender Tool						
Mobile Application Development using Android						
Mobile Application Development using Windows						

SEMESTER III

Course Code: 141CS0301	**Course Title:** DIGITAL SYSTEM DESIGN
Core/Elective: Core	**L : T : P : C : M** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):

- Engineering Physics
- Basics of Electrical & Electronics Engineering

Course Outcomes

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

CO1. Interpret the number systems, codes, Boolean rules, laws and postulates used in digital design.
CO2. Illustrate the simplification techniques used for combinational circuit design.
CO3. Analyze and design the synchronous sequential logic circuits.
CO4. Comprehend the memory organization and transistor logic.
CO5. Design and Implement HDL programs for combinational and Sequential circuits

Course Content

UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA 9

Review of binary, octal and hexadecimal number systems - Conversion methods- One's complement -Two's complement - addition, subtraction- Computer codes - BCD, Gray code - parity codes- Hamming codes- Boolean algebra – basic postulates, theorems , Boolean functions, canonical forms-logic gates.

UNIT II COMBINATIONAL LOGIC DESIGN 9

Standard representation of logic functions- Simplification of logic functions through K-maps and tabulation method- Implementation using logic gates – Adder, subtractor, decoder, encoder, multiplexer and de-multiplexer.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Introduction to sequential circuits- Flip-flops- latches - Level triggering, edge triggering- Master slave configuration - Design and analysis of synchronous sequential circuits- Shift registers - Up/down, binary and modulus counters

UNIT IV MEMORY ORGANIZATION AND TRANSISTOR LOGIC 9

Memory Organization: Main Memory - ROM, RAM and its types - Programmable memory (PLA and PAL).Sequential Programmable Devices-TTL and ECL.

UNIT V HARDWARE DESCRIPTION LANGUAGE 9

Introduction to VHDL-Behavioral Modeling - Structural Modeling - HDL description of Combinational Circuit- HDL description of Sequential Logic Circuits:-Flip Flops, Counters.

TEXT BOOK:

1. M. Morris Mano and Michael D.Ciletti, "Digital Design", Fourth Edition, Pearson Education, 2008.

REFERENCES:

1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition, Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill, 2003.
4. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.

WEB REFERENCES

1. http://nptel.ac.in/courses/117105080/1-28
2. http://nptel.ac.in/video.php/subjectId=117106086/
3. http://freevideolectures.com/Course/2319/Digital-Systems-Design/3/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3								3	3
CO2	3										3	
CO3	3	3		3							3	
CO4	3										3	
CO5	3		3		3						3	3

Course Code: 141CS0302	Course Title: ENGINEERING MATHEMATICS - III
Core/Elective: Core	L : T : P : C : M – 4 : 0 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Prerequisites: The student should have undergone the course(s):

- Engineering Mathematics I

Course Outcomes

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

CO1. Describe the basic concepts of vector spaces.
CO2. Apply inner product of vectors to produce an orthonormal basis.
CO3. Apply the concept of diagonalization in singular value decomposition of a matrix.
CO4. Compute the Fourier series expansion for a given periodic function**.**
CO5. Calculate the Fourier transform of an aperiodic function**.**

Course Content

UNIT I VECTOR SPACES 12

Vector spaces, Subspace of a vector space, Basis and dimension of vector space, Linear combination and spanning sets of vectors, Linear independence and linear dependence of vectors, Row space, Column space and Null space, Rank and nullity of subspaces, Inner product of vectors, Length of a vector, Distance between two vectors.

UNIT II ORTHOGONALITY AND INNER PRODUCT SPACES 12

Orthogonality of vectors, Orthogonal projection of a vector, Gram-Schmidt process to produce orthogonal and orthonormal basis, Inner product spaces, Fourier approximation of continuous functions using inner product spaces.

UNIT III SYMMETRIC MATRICES AND QUADRATIC FORMS 12

Diagonalization of symmetric matrices, Spectral Theorem, Spectral Decomposition, Quadratic forms, constrained optimization, Singular Value Decomposition.

UNIT IV FOURIER SERIES 12

Fourier series, Dirichlet's condition, Half range sine and cosine series, Parseval's identity, Harmonic analysis.

UNIT V FOURIER TRANSFORMS 12

Fourier transforms**,** Fourier Cosine and Sine transforms, Inverse transforms, Convolution theorem, Parseval's identity for Fourier transforms

TEXT BOOKS:

1. David C. Lay, "Linear algebra and its Applications", Third Edition, Pearson education, 2003
2. Srimanta Pal, Subodh C. Bhunia. Engineering Mathematics, First edition, 2015, Oxford University Press.

REFERENCES:

1. Venkataraman M.K , "Engineering Mathematics Vol 4" , National Publishing Company, 2004
2. Ramana .B.V , " Higher Engineering Mathematics" Tata McGraw Hill publishing company limited, 2007, New Delhi
3. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Tenth Edition, John Wiley & Sons, 2005

WEB REFERENCES

1. http://nptel.ac.in/courses/111106051/
2. http://nptel.ac.in/downloads/111102011/
3. http://nptel.ac.in/downloads/111108066/
4. http://nptel.ac.in/courses/111103021/15
5. http://www.nptel.ac.in/courses/117101055/downloads/Lec-15.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3										2

Course Code: 141CS0303	Course Title: PRINCIPLES OF COMMUNICATION ENGINEERING
Core/Elective: Core	L : T : P : C : M – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Prerequisites: The student should have undergone the course(s):

- Basics of Electrical and Electronics Engineering

Course Outcomes

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

CO1. Compare various analog modulation techniques
CO2. Compare analog and digital modulation techniques
CO3. Describe pulse modulation techniques
CO4. Explain the concepts related to satellite and optical communication
CO5. Explain wireless communication concepts

Course Content

UNIT I ANALOG COMMUNICATION 9

Basic schemes of modern communication system-Need for modulation-Types. Basics of amplitude modulation (Definition, AM waveforms, Equation, Frequency spectrum and bandwidth, Modulation index and power distribution).Frequency Modulation, Equation of FM wave, Effect of Noise in FM Noise, Comparison of AM and FM signals. Phase Modulation-Definition and equation of a PM wave.

UNIT II DIGITAL COMMUNICATION 9

Introduction, Shannon limit for information capacity, bits, bit rate, baud. ASK-FSK Transmitter and Receiver, phase shift keying – binary phase shift keying, QPSK, Quadrature Amplitude modulation - Principle, transmitter and Receiver (block diagram only).

UNIT III DIGITAL TRANSMISSION 9

Introduction, Pulse modulation, PCM – PCM sampling, sampling rate, signal to, quantization noise - ratio – Companding (analog and digital) -delta modulation, adaptive delta modulation, differential pulse code modulation, Inter symbol Interference, eye patterns.

UNIT IV SATELLITE AND OPTICAL COMMUNICATION 9

Satellite communication systems - Kepler's law – LEO, MEO and GEO orbits - GPS System - Footprint - Link model- Optical communication systems-Elements of optical fiber transmission link - Types - Losses

UNIT V MOBILE COMMUNICATION 9

Multiple access techniques: TDMA, FDMA, CDMA- Advanced Mobile Phone System (AMPS) - Cellular Concept and Frequency Reuse - Channel Assignment and Hand off – GPRS - Global System for Mobile Communications (GSM) – 2G -3G - 4G-5G systems

TEXT BOOKS:

1. Wayne Tomasi, "Advanced Electronic Communication Systems", Sixth Edition, Pearson Education, 2007
2. Rappaport T.S, "Wireless Communications: Principles and Practice", Second Edition, Pearson Education, 2009

REFERENCES:

1. Simon Haykin, "Communication Systems", Fourth Edition, John Wiley & Sons. 2001
2. Lathi. B.P., "Modern Analog and Digital Communication systems", Third Edition, Oxford University Press, 2007
3. Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2012
4. Dennis Roddy and John Coolen," Electronic Communications", Fourth Edition, Pearson Education India, 2012
5. B.Sklar, "Digital Communication Fundamentals and Applications", Second Edition Pearson Education 2007

WEB REFERENCES

1. http://www.nptel.ac.in/course.php?disciplineId=106
2. http://ocw.mit.edu/courses/electrical-engineering-and-computerscience/6-450-principles-of-digital-communications-i-fall-2006

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		1								2
CO2	1	3	3	3	2							
CO3		3	3		1						1	
CO4		2	3	3							1	
CO5	3	1			2							2

Course Code: 141CS0304	Course Title: OPERATING SYSTEMS
Core/Elective: Core	L : T : P : C : M – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Prerequisites: The student should have undergone the course(s):

- Fundamentals of Programming

Course Outcomes

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

CO1. Elaborate on evolution and basics of operating systems design.
CO2. Choose appropriate process and disk scheduling algorithm for various scenarios
CO3. Provide solutions for various synchronization and deadlock problems.
CO4. Compare different memory management techniques for operating systems.
CO5. Explain the various file system structures and its implementation.

Course Content

UNIT I OPERATING SYSTEM – COMPONENTS AND SERVICES 9

Operating systems - Definition - Views of OS - Main frame Systems, Desktop Systems – Multiprocessor Systems -Distributed Systems – Clustered Systems – Real Time systems – Hand held Systems. Functionalities of operating system - Program execution, I/O operation, File system manipulation, error detection - OS Services – System Calls – System Utilities

UNIT II PROCESS SCHEDULING AND DISK SCHEDULING 9

Process concepts - Process scheduling - Short term, long term and medium term scheduling -Preemptive and non-preemptive algorithms - CPU scheduling algorithms - FCFS, SJF, Priority and round robin - Basic disk structure and operation - Disk scheduling algorithms - FCFS, SSTF, LOOK, SCAN, C-SCAN, C-LOOK - selection of the best disk scheduling algorithm.

UNIT III PROCESS SYNCHRONIZATION 10

Inter-process communication techniques - message passing, shared memory, Synchronization- critical section problem-Peterson's solution, synchronization hardware, Synchronization tool- Semaphores, Classic Problems of Synchronization-Reader Writer Problem, Bounded buffer, Dining Philosopher's problem. Deadlock-characteristics, Deadlock handling methods –Deadlock prevention, Deadlock detection, Deadlock Avoidance, Deadlock Recovery.

UNIT IV MEMORY MANAGEMENT 10

Memory concept- Swapping, Contiguous memory allocation, Fragmentation, Paging –Hierarchical Paging, Hashed Page Tables, Inverted Page Tables, Segmentation-Paging with Segmentation, Virtual memory - Demand paging, Page-replacement algorithms-FIFO, Optimal Page Replacement, LRU,LFU,MFU

UNIT V FILE MANAGEMENT 7

File structures: File concept, File Type, Access methods, Directory structure -Single level directory, two level and Tree structure. File system implementation-FCB, Virtual File system, Directory System Implementation- linear list, hash table implementation.

TEXT BOOK:

1. Avi Silberschatz, Galvin. P.B., Gagne. G. "Operating System Concepts", Eighth Edition, John Wiley & Sons, 2008.

REFERENCES:

1. Pradeep K.Sinha, "Distributed Operating System: Concepts and Design", IEEE computer Society Press, PHI, 2004
2. Andrew S. Tanenbaum , "Modern Operating Systems", PHI , Second Edition, 2001
3. Charles Crowley, "Operating systems A Design oriented Approach" , Second Edition, Irwin Professional Publication, 1996.

WEB REFERENCES

1. http://nptel.ac.in/courses/106108101/
2. https://edurev.in/studytube/Notes-Introduction--System-Structures-Operating-Sy/7c9a5bae-816e-4804-9afa9941b7b24ae1_p
3. https://www.youtube.com/watch?v=A9CCDS3Jizc&list=PLLDC70psjvq5hIT0kfr1sirNuees0NIbG&index=7

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											1
CO2	3	3	2						2	1		
CO3	3	3	2	2					2	1		
CO4	3		2						2	1		1
CO5	3											1

Course Code: 141CS0305	Course Title: DATA STRUCTURES AND ALGORITHM ANALYSIS -I
Core/Elective: Core	L : T : P : C : M – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Prerequisites: The student should have undergone the course(s):

- Fundamentals of Programming

Course Outcomes

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

CO1. Describe the need for data structures and the notations used in algorithm analysis
CO2. Perform operations on linear data structures for various applications
CO3. Determine the complexity of recursive and non-recursive algorithms
CO4. Compare the efficiency of brute force & divide and conquer techniques for problem solving
CO5. Implement hashing and string matching techniques

Course Content

UNIT I BASIC CONCEPTS OF ALGORITHMS 9

Introduction, Classification of Data Structures, Abstract data type, Algorithm properties, Fundamentals of algorithmic Problem solving, Fundamentals of analysis framework, Efficiency classes, Asymptotic notations.

UNIT II LINEAR STRUCTURES 10

List: Array implementation, Linked List implementation: Singly, Doubly and Circular Linked list, Applications of List, Stack: Implementation, Applications, Queue: Implementation, Applications

UNIT III MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHMS 8

Mathematical analysis of non-recursive algorithms, Mathematical analysis of recursive algorithms, Empirical analysis of algorithms, Algorithm visualization

UNIT IV SIMPLE ALGORITHMIC DESIGN TECHNIQUES 10

Brute force approach, Exhaustive Search, Divide and Conquer technique: matrix multiplication, Strassen's algorithm, Searching: Linear search, Binary search, Sorting: Selection sort, Bubble sort, Merge sort, Quick sort, Insertion sort

UNIT V HASHING AND STRING MATCHING 8

Hashing: Separate chaining, Open addressing, Double hashing, Rehashing, Extendible hashing, String matching: Naive approach, KMP algorithm

TEXT BOOKS:

1. Mark A. Weiss., "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2013.
2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Pearson Education, Third Edition, 2011.

REFERENCES:

1. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Second Edition, Universities Press, 2005.
2. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structures and Algorithms in C++", Second Edition, John Wiley & Sons, 2010
3. Cormen.T.H., Leiserson.C.E., Rivest. R.L. and Stein.C., "Introduction to Algorithms", PHI Pvt. Ltd., 2001.

WEB REFERENCES:

1. http://visualgo.net/
2. http://nptel.ac.in/courses/106102064/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3					1					
CO2	3	2	3	3	2		2					2
CO3	3	3		3	3		3					2
CO4	3	2	3	3	3		3					2
CO5	3	2			2		2					

Course Code: 141CS0306	Course Title: OBJECT ORIENTED PROGRAMMING
Core/Elective: Core	L : T : P : C : M – 3 : 0: 2 : 4 : 100
Type: Lecture & Practical	Total Contact Hours: 75

Prerequisites: The student should have undergone the course(s):

- Fundamentals of Programming
- C Programming

Course Outcomes

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

CO1. Distinguish between the features of Structured and Object Oriented Programming languages
CO2. Examine various control flows and memory management techniques
CO3. Implement various principles of object orientation
CO4. Choose appropriate input and output operators for file manipulations
CO5. Apply advanced features of OOP in real world applications

Course Content

UNIT I FEATURES OF OBJECT ORIENTED PROGRAMMIMG 9

Structured Programming Concepts and Modules - Pros and Cons - Object Oriented Programming – Concepts and Paradigm – Need for OOP approach - Analysis of Structural and OOP approaches – Classes and Objects - Declaration and Object Creation - Access Specifiers.

UNIT II CONTROL FLOW & MEMORY MANAGEMENT 9

Function declaration - Call by value and Call by reference - Friend functions - Accessing functions between classes - Dynamic Memory Allocation – Constructors – Destructors – Realloc - Operator Overloading

UNIT III OOP PRINCIPLES 9

Inheritance - Types of Inheritance – Polymorphism: Function overloading - Virtual functions – Abstraction - Abstract Class and Virtual base class - Encapsulation and Data Hiding

UNIT IV I/O OPERATORS 9

C++ I/O System basics - C++ Stream classes - Formatted I/O - Overloading << and >> - Opening & Closing; Reading and Writing Text Files - Unformatted and Binary I/O - Random Access - Status of I/O and Customization

UNIT V ADVANCED CONCEPTS 9

Generic functions - Generic class - Exception types and Handling - Applying Exception Handling - Run Time Type Identification (RTTI) - Type Casting operations - Namespaces - Creating conversion functions

Lab Component **Total: 30**

Implement the following concepts using suggested list of applications:

1. Implementation of Selection and Iteration statements
2. Program using Classes and Objects
3. Implementing function call by reference, call by value and friend functions
4. Implement memory management techniques in C++
5. Program using Inheritance
6. Implementing Polymorphism in C++
7. Working with file operations
8. Implementing random access in files
9. Implementing generic classes and templates
10. Program to implement exception handling

Suggested list of applications:

1. Online Course Registration System.
2. Hospital Management System
3. Online Examination Management System
4. Library Management System
5. Payroll system for a company
6. Travel management System

7. Hotel management System
8. Student Information System
9. Online Polling System
10. Inventory Control system

TEXT BOOK:

1. Herbert Schildt, "The Complete Reference: C++", McGraw- Hill Companies, Fourth Edition, 2003

REFERENCES:

1. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley, Fourth Edition, 2013
2. Jana Debasish, "C++ and Object - Oriented Programming Paradigm" PHI Learning; Third Edition, 2014
3. E.Balagurusamy, "Object Oriented Programming with C++", McGraw- Hill Companies, Sixth Edition, 2013

WEB REFERENCES:

1. http://people.cs.aau.dk/~torp/Teaching/E03/OOP/handouts/
2. https://drive.google.com/file/d/0B_9nttbyYh5MRW1QS1FOODJaZFk/view?pref=2&pli=1
3. http://people.cs.aau.dk/~normark/oop-csharp/html/notes/intro-oop-book.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	1	3							3	2
CO2		3	3	3	2						3	2
CO3		1	2	2	2						3	3
CO4		2	2	2	2						3	2
CO5	3	3	3	3	3						3	3

Course Code: 141CS0307	Course Title: DATA STRUCTURES AND ALGORITHM ANALYSIS -I LABORATORY
Core/Elective: Core	L : T : P : C : M – 0 : 0 : 4 : 2 : 100
Type: Practical	Total Contact Hours: 60

Course Outcomes

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

CO1. Develop recursive and non recursive algorithms for solving simple problems
CO2. Implement linear data structures using array and linked list representations and use these in various applications.
CO3. Compare the efficiency of Brute-Force and Divide & Conquer approaches for Searching, Sorting and Geometric problems.
CO4. Implement Hashing and String matching techniques

LIST OF EXPERIMENTS:

1. Implementation of simple recursive and non recursive algorithms
2. Implementation of List application
3. Implementation of Stack application
4. Implementation of Queue application
5. Empirical analysis of Searching techniques
6. Empirical analysis of Sorting techniques
7. Visualization of Searching & Sorting Algorithms
8. Implementation of Closest Pair and Convex Hull problems
9. Implementation of Hashing & String Matching algorithm

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3			3		3		2			
CO2	3	2	3	3	2		2		2			2
CO3	3	2	3	3	3		3		2			2
CO4	3	2			2		2		2			

Course Code: 141CS0308	Course Title: DIGITAL SYSTEM DESIGN LABORATORY
Core/Elective: Core	**L : T : P : C : M** – 0 : 0 : 4 : 2 : 100
Type: Practical	**Total Contact Hours:** 60

Course Outcomes

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

CO1. Implement the circuits of combinational design.
CO2. Design the synchronous and asynchronous counter and implement it.
CO3. Develop the shift registers and its types.
CO4. Implement the combinational and sequential concepts in VHDL programming.

LIST OF EXPERIMENTS:

1. Study of Gates & Flip-flops
2. Half Adder and Full Adder
3. Magnitude Comparator (2-Bit)
4. Encoders and Decoders
5. Multiplexer and Demultiplexer
6. Code Converter
7. Synchronous Counters
8. Ripple Counter
9. Mod - N Counter
10. Shift Register - SISO & SIPO
11. Verilog HDL based design of combinational circuits and sequential circuits.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2			2				2		3	1
CO2	3	2	2		2				2		3	1
CO3	3	2	2		2				2		3	1
CO4	3	2			3				2		3	1

Course Code: 141CS0309	Course Title: PERSONAL EFFECTIVENESS
Core/Elective: Core	**L : T : P : C : M** – 0 :0 :2 :1 :100
Category: Practical	**Total Contact Hours:** 30

Course Outcomes

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

CO1. Identify the strengths, weaknesses and opportunities

CO2. Set well-articulated goals for academics, career, and personal aspirations

CO3. Establish the road map to realize the goals

CO4. Apply time management techniques to complete planned tasks on time

CO5. Create time and pursue activities of self-interest that add value

UNIT I THE IMPORTANCE OF ENVISIONING 8

Importance of positive self-perception – Principle of dual creation (Everything gets created twice – Envisioning) - Understanding vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people – Importance of goal setting –Importance of planning and working to time

UNIT II FUNDAMENTAL PRINCIPLES OF GOAL SETTING AND WORKING TO TIME 8

Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, what you see depends on the role you assume

UNIT III GOAL SETTING AND ACTION ORIENTATION 6

Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs. gain, Gun-point commitment – Importance of action orientation - Converting goals to actionable tasks – Establishing road map – Using Gantt chart for planning and progress

UNIT IV TIME MANAGEMENT - TOOLS AND TECHNIQUES 8

Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

UNIT V PUTTING INTO PRACTICE 8

Practical's: Using the weekly journal – Executing and achieving short term goals – Periodic reviews

Course handouts (compiled by PS team, MCET)

1. Learner's workbook
2. Personal efficiency Journal
3. Reading material for Personal Effectiveness

Further Reading:

1. Stephen R Covey, "First things first", Simon & Schuster, Aug 1997.
2. Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster, 2004.
3. College student's guide to time management (e-book)
4. Michael S Dobson, Susan B Wilson, "Goal setting" (e-book)

Modality on Tests and Examinations

S.No	Test/Examination	Criterion	Reduced to marks	Remarks
1	Knowledge test (KT)	Best out of 'n' tests (each conducted for 20 marks) Minimum two tests to be conducted	20 marks	After initial orientation
2	Scenario based knowledge test (SKT)	Best out of the two tests (Maximum for each test is 80 marks)	20 marks	Immediately before and after Reinforcement Workshop

3	Comprehensive Examination	Work book Journal work Viva voce	= 20 marks = 40 marks = 40 marks	60 marks	Conducted at the End of semester by a panel of Internal faculty members
		Total	= 100 marks		
		Mark will be entered in Examination Portal for 100 marks			
		Total marks for the course		100 marks	
		Condition for passing the course		50 marks as a whole	

No. of hours & credits:

Enablement through learning workshops	Trained Internal faculty	2 days 7 hours each	14 hours
Progress monitoring (face to face interaction with student and checking workbook/Journal)	Internal faculty	1 hour per week	10 hours
Mid semester reinforcement- workshop	Trained Internal faculty	1 day	6 hours
		Total	30 hours
		No. of credits	1

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									3		2	2
CO2									3		2	2
CO3									3		2	2
CO4									3		2	2
CO5									3		2	2

END OF SEMESTER III

SEMESTER IV

Course Code: 141CS0401	**Course Title:** DATABASE SYSTEMS
Core/Elective: Core	**L : T : P : C : M** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):

- Data Structures and Algorithms I
- Engineering Mathematics III

Course Outcomes

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

CO1. Elaborate on File systems and Database systems by enumerating the features provided by database systems and describe each in both function and benefit
CO2. Demonstrate the relational data model by constructing the ER diagrams
CO3. Formulate solutions to a broad range of query and data manipulation problems using SQL
CO4. Solve concurrency issues in Database Transactions
CO5. Summarize the concepts and application of DDBMS and OODBMS.

Course Content

UNIT I INTRODUCTION TO DBMS 9

File System-Database System - File System Vs DBMS - Roles in DBMS Environment - Data Models and Conceptual Modeling - Functions of DBMS - Components of DBMS - Multiuser DBMS architecture

UNIT II RELATIONAL MODEL, ER MODEL AND NORMALIZATION 9

Relational Model: Terminology - Integrity Constraints – Views - Relational Algebra - ER Modeling: Concepts - Relationship Types – Attributes - Structural Constraints - Problems with ER Model - Normalization: Data Redundancy and update anomalies - Functional Dependencies -1NF, 2NF, 3NF

UNIT III SQL & QUERY PROCESSING 9

SQL: Terminology - Data Manipulation - Data Types - Data Definition – Views - Access Control - Query Processing: Decomposition - Heuristical approach to query optimization - Cost Estimation - Query Optimization in Oracle

UNIT IV TRANSACTION AND CONCURRENCY CONTROL 9

Transaction: Properties - Concurrency Control: Locking methods, Deadlock, Timestamp ordering, Multi-version timestamp ordering - optimistic techniques - Database Recovery: Transaction and recovery - Recovery facilities, Recovery Techniques - Concurrency control and recovery in Oracle.

UNIT V DISTRIBUTED AND OBJECT ORIENTED DBMS 9

Distributed DBMS (DDBMS): Concepts - Homogenous and Heterogeneous DDBMS - Functions of DDBMS - Architecture of DDBMS - Date's twelve rules for a DDBMS - Distributed Transaction Management - Distributed concurrency control - Distributed Database Recovery-Object Oriented DBMS: Introduction - Issues in OODBMS - Advantages and Disadvantages of OODBMS

TEXT BOOKS:

1. Thomas Connolly, Carolyn Begg, "Database Systems: A practical approach to design, Implementation and Management", Pearson, New Delhi, 2014.
2. A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", Sixth Edition McGraw-Hill, New Delhi

REFERENCES:

1. Peter Rob, "Database Systems: Design, Implementation, and Management", Seventh Edition, Course Technology, USA
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson, New Delhi,2010

WEB REFERENCES:

1. https://www.cse.iitb.ac.in/~sudarsha/db-book/slide-dir/
2. http://codex.cs.yale.edu/avi/db-book/
3. www.db-book.com/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1			1	2	1					1	3
CO2	1	2	3	2	3	1	1	1				2
CO3	2	2	3	1	3	1		1			2	2
CO4	1	2	3	1	2	1		1			1	1
CO5	1	1	1	1	1			1			2	3

Course Code: 141CS0402	Course Title: PROBABILITY AND QUEUEING THEORY
Core/Elective: Core	L : T : P : C : M – 4 : 0 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Prerequisites: The student should have undergone the course(s):

- Engineering Mathematics I
- Engineering Mathematics II
- Engineering Mathematics III

Course Outcomes

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

CO1. Interpret the basic concepts of Probability.
CO2. Calculate the moments of the discrete and continuous random variables.
CO3. Apply the discrete and continuous probability distributions to real life phenomena.
CO4. Use sample mean and variance to test small and large samples.
CO5. Calculate characteristic features of different queuing systems.

Course Content

UNIT I PROBABILITY THEORY 9+3

Probability theory, Introduction, Axioms of probability, Conditional probability, Baye's theorem.

UNIT II RANDOM VARIABLES 9+3

Random Variables, Discrete random variables, Probability mass function, Cumulative distribution function, Expectations, Variances and moments of discrete random variables, Continuous random variables, Probability density functions, Expectations and variances of continuous random variables, Moment generating function.

UNIT III STANDARD DISTRIBUTIONS 9+3

Discrete Distributions- Binomial, Poisson and Geometric distributions, Properties, Moment generating functions. Continuous Distributions - Normal, Uniform and Exponential distributions, Properties, Moment generating functions.

UNIT IV TEST OF HYPOTHESES 9+3

Sampling distributions, Estimation of parameters, Statistical hypothesis, Large sample test based on Normal distribution for single mean and difference of means, Tests based on t, Chi-square and F distributions for mean, variance and proportion , Contingency table (test for independent), Goodness of fit.

UNIT V QUEUING THEORY 9+3

Markovian models, Infinite capacity single server, Infinite capacity multiple Server, Finite capacity single server, Finite capacity multiple server, Little's formula.

TEXT BOOKS:

1. J. Ravichandran, "Probability and Statistics for Engineers", Wiley India Publication, 2010
2. T. Veerarajan, "Probability, Statistics and Random Process" Tata McGraw Hill, 2006

REFERENCES:

1. R.E. Walpole, R.H. Myers, S.L. Myers, and K. Ye, "Probability and Statistics for Engineers and Scientists", Eighth edition, Pearson Education, Asia, 2007.
2. Murray R Spiegel, John J Schiller and R Alu Srinivasan, "Schaum's Outlines of Probability and Statistics", fourth edition, Tata McGraw Hill, 2004.

WEB REFERENCES:

1. http://nptel.ac.in/downloads/111101004/
2. http://nptel.ac.in/courses/111105041/10
3. http://nptel.ac.in/courses/111104079/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3										2

Course Code: 141CS0403	Course Title: COMPUTER ARCHITECTURE
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Prerequisites: The student should have undergone the course(s):

- Digital System Design
- Operating Systems

Course Outcomes

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

CO1: Describe the memory organization for instruction execution and various addressing modes
CO2: Summarize the various components of the processing unit and it's bus organizations
CO3: Describe the various pipeline hazards and it's concepts
CO4: Explain the concept of Instruction Level Parallelism and it's challenges
CO5: Explain the concepts of Parallel Processing Architecture and Embedded systems with real - time examples

Course Content

UNIT I MEMORY ORGANIZATION AND ADDRESSING 9

Basic Processor Architecture - Operational concepts –Performance -Memory Allocation –Memory Operations –Instructions and sequencing-Addressing modes.

UNIT II INPUT / OUTPUT AND BUS ORGANIZATION 9

Accessing I/O devices - Interrupts – DMA- Buses - Interface Circuits - Standard I/O interfaces - Single Bus Organization-Multiple Bus Organization - Superscalar operation.

UNIT III PIPELINING 9

Pipelining Concept - Pipeline Hazards - Pipelining Implementation -Extending the MIPS pipeline to handle Multicycle Operations - Overview of MIPS R4000 Pipeline

UNIT IV INSTRUCTION - LEVEL PARALLELISM 9

ILP Concepts and Challenges - Basic Compiler Techniques for Exposing ILP - Reducing Branch Costs with Prediction - Overcoming Data Hazards with Dynamic Scheduling –Tomasulo's Approach - Hardware Based Speculation - Exploiting ILP: Multiple Instruction Issues- Static Scheduling- Dynamic Scheduling

UNIT V PARALLEL PROCESSORS AND EMBEDDED SYSTEMS 9

Parallel processing - Array Processor - Structure of General Purpose Multiprocessors-Program Parallelism and shared variable - Processor families: overview of ARM Family and Intel Family - Embedded Systems: Microwave oven- Digital camera-Embedded processor chips – Microcontrollers for Embedded systems

TEXT BOOKS:

1. Carl Hamacher, Zvonok Vranesic Safwat Zaky, "Computer Organization", Fifth edition, McGraw Hill, 2002.
2. John L. Hennessey and David A. Patterson, "Computer Architecture: A Quantitative Approach", Fifth Edition, Elsevier, 2011.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture -Designing for Performance", Pearson Education, Ninth Edition, (Hardcover Revised) 2012.
2. S.S.S.P.Rao, "Basics of Computer Organisation and Architecture: Problems and Solutions", Alpha Science International Ltd, 2014.
3. David A. Patterson and John L. Hennessey, "Computer Organization and design, The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann, 2009.
4. John P.Hayes, "Computer Architecture and Organization", Third edition, McGraw Hill, 2002.
5. B.Govindarajalu, "Computer Architecture and Organization", Second edition, McGraw Hill, 2010.

WEB REFERENCES:

- http://www.technolamp.co.in/2011/04/computer-organization-carl-hamacher.html
- http://www.cse.iitk.ac.in/users/karkare/courses/2011/cs220/html/notes.html
- http://www.nptel.ac.in/courses/106102062/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						1					
CO2	3										2	
CO3	3					2						
CO4	3											
CO5	3		2			2	1				3	2

Course Code: 141CS0404	Course Title: SOFTWARE ENGINEERING
Core/Elective: Core	L : T : P : C : M – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Course Outcomes

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

CO1. Evaluate SLC models for software development
CO2. Derive the requirements for a software system using system models
CO3. Select appropriate architecture and principles to design software systems
CO4. Develop test plan for verifying and validating requirements and design
CO5. Elaborate on project management and current trends in software engineering

Course Content

UNIT I SOFTWARE LIFECYCLE MODELS 9

Software Engineering as a discipline, Software processes, Software Specification, Software design and implementation, Software evolution, Software prototyping, Waterfall Model, Incremental Model, Spiral Model, Agile Software Development, Case Study

UNIT II REQUIREMENTS ENGINEERING AND ANALYSIS 9

User and system requirements, Functional and non-functional requirements, Requirements engineering processes, Software requirements document, Requirements elicitation and analysis, Requirements validation, Requirements management, Activity diagrams, Use case diagrams, Sequence diagrams, Class diagrams, State diagrams, UML, Context models, Interaction models, Structural models, Behavioral Models, Model-driven engineering

UNIT III SOFTWARE DESIGN 9

Design process, Design Concepts - Abstraction, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Cohesion, Coupling, Object-Oriented Design Concepts, Design Classes, Dependency Inversion - Architectural design and decisions, Architectural views, Layered architecture, Repository (data-centric) architecture, Client-server architecture, Pipe and filter architecture, Object-oriented design, Design Patterns, Transaction processing systems, Information Systems, Language processing systems

UNIT IV DESIGN OF SPRINGS 9

Verification, Validation, Strategic approach to software testing, Strategic issues, Test Strategies for Conventional Software, Test Strategies for Object - Oriented Software, Testing OOA and OOD Models, Object-Oriented Testing Strategies, Object - Oriented Testing Methods, Testing Methods Applicable at the Class Level, Interclass Test - Case Design, Test Strategies for Web & Mobile Apps, Validation testing, System Testing, Debugging process, White box testing- Black box testing

UNIT V ADVANCED TOPICS AND SOFTWARE MANAGEMENT 9

Software Reuse, CBSE, Service Oriented Architecture, Aspect-oriented Software Engineering, Software Risk Management, Software Scheduling, Software Configuration Management (SCM)

TEXT BOOKS:

1. Roger S.Pressman and Bruce Maxim, "Software engineering- A practitioner's Approach", McGraw-Hill International Edition, Eighth edition, 2014.
2. Ian Sommerville, "Software Engineering", Pearson Education Asia, Ninth edition, 2011.

REFERENCES:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer Verlag, 1997.
2. James F Peters and Witold Pedryez, "Software Engineering - An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
3. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996.

WEB REFERENCES:

1. http://www.mhhe.com/engcs/compsci/pressman/
2. http://iansommerville.com/software-engineering-book/
3. http://www.sei.cmu.edu/
4. https://narbit.wordpress.com/2012/06/10/the-differences-between-life-cycle-models-advantages-and-disadvantages/
5. http://www.nptel.ac.in/courses/106101061/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3		3	2	2	2	2			1
CO2	3	2	3		2		1		3	2		2
CO3	3	2	3	3	3		2	2	2		3	
CO4	3	2	3		3		1		1			
CO5	3	2	3		2		1		3	2	3	3

Course Code: 141CS0405	Course Title: DATA STRUCTURES AND ALGORITHM ANALYSIS -II
Core/Elective: Core	L : T : P : C : M – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Prerequisites: The student should have undergone the course(s):

- Data Structures and Algorithms I

Course Outcomes

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

CO1. Perform various operations on Binary trees and Heaps
CO2. Implement operations on Search tree structures
CO3. Perform operations on Graphs and Sets
CO4. Solve problems using Greedy strategy & Dynamic Programming techniques
CO5. Solve problems using Backtracking & Branch and Bound techniques

Course Content

UNIT I TREE STRUCTURES 8

Tree: Preliminaries, Binary trees, Tree traversal, Application: Expression tree, Decision tree, Game tree, Binary heap, Heap sort

UNIT II SEARCH TREE STRUCTURES 9

Binary search tree, AVL tree, B-Trees, k-d Tree, Tries

UNIT III GRAPH 8

Graph: Definitions, Representation, Topological sort, Breadth-first traversal, Depth-first traversal, Biconnectivity, Euler circuits, Sets: Representation, Operations

UNIT IV GREEDY METHOD AND DYNAMIC PROGRAMMING 10

Greedy technique: Dijikstra's algorithm, Prim's and Kruskal's algorithm, Huffman tree Dynamic Programming: Binomial Coefficient, Floyd's and Warshall's algorithm, Multistage Graph, Optimal Binary Search Tree.

UNIT V BACKTRACKING & BRANCH AND BOUND 10

Limitations of Algorithm Power: P, NP and NP- Complete Problems Backtracking: n-Queens problem, Hamiltonian Circuit, Subset-Sum problem Branch and Bound: Assignment problem, Knapsack problem, Travelling salesman problem

TEXT BOOKS:

1. Mark A. Weiss., "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2013.
2. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Pearson Education, Third Edition, 2011.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second edition, Galgotia Publications, 2010
2. Adam Drozdek, "Data Structures and Algorithms in C++", Cengage Learning, Fourth Edition, 2013
3. Cormen.T.H., Leiserson.C.E., Rivest. R.L. and Stein.C., "Introduction to Algorithms", PHI Pvt. Ltd., 2001.

WEB REFERENCES

1. http://nptel.ac.in/courses/106101060/
2. http://www.animatedrecursion.com/
3. http://www.claymath.org/millennium/P Vs NP/pvsnp.pdf
4. http://www.cut-the-knot.org/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1		1					1
CO2	3	2	3	2	2		3					3
CO3	3	1			1							2
CO4	3	2	3	3	3		3					3
CO5	3	2	3	3	3		3					3

Course Code: 141CS0406	Course Title: JAVA PROGRAMMING
Core/Elective: Core	L : T : P : C : M – 3 : 0 : 2 : 4 : 100
Type: Lecture	Total Contact Hours: 75

Prerequisites: The student should have undergone the course(s):

- Object Oriented Programming

Course Outcomes

At the end of the course students will be able to:
CO1. Understand the distinct properties and features of Java
CO2. Implement name spaces, concurrency and handle exceptional conditions in programs
CO3. Employ Java standard library functions for solving complex problems
CO4. Apply Java utility, input/output functions and file manipulators
CO5. Develop Java applications using user interfaces and database connectivity

Course Content

UNIT I INTRODUCTION **9**

Overview of Java – Data types, operators, control flows –Class fundamentals, objects and constructors –Method overloading-argument passing, Returning objects, recursion – Method Overriding and Dynamic Method dispatch- Abstract class

UNIT II PACKAGES, EXCEPTIONS AND THREADS **9**

Packages and access protection – Interfaces and extending interfaces – Exception fundamentals and types – Try, catch, throw, throws and finally; Chained Exceptions – Thread model, Creating threads and thread priorities – Synchronization – Interthread communication

UNIT III JAVA UTILITIES **9**

String Handling – String Buffer class and functions – Library Functions – Math – Process – Clone – System Functions

UNIT IV COLLECTIONS AND I/O STREAMS **9**

Collections – Classes and Interfaces – Iterators and User defined collections – String Tokenizer – Java I/O classes and Interfaces - Streams – Byte Streams - Character Streams – File concepts

UNIT V EXPLORING SWING **9**

Java Swing – Features –Components and Containers – Event handling – Exploring Swing – Menus – Java Database Connectivity

Lab Component **Total: 30**

Implement the following concepts using Java for any scenario in the given list of applications:

1. Program using control flow and function overloading
2. Implementing method overriding and abstraction
3. Creating packages and user-defined exceptions
4. Implementing synchronization and inter thread communication
5. Working with String operations
6. Using Library and System functions
7. Working with Collection classes and Iterators
8. Accessing files using I/O methods in java
9. Creating GUI using java Swing
10. Implementing database connectivity using java

The suggested applications are:

1. Online Course Registration System.
2. Hospital Management System
3. Online Examination Management System
4. Library Management System
5. Payroll system for a company
6. Travel management System
7. Hotel management System
8. Student Information System
9. Online Polling System
10. Inventory Control system

TEXT BOOKS:

1. Herbert Schildt, "Java the Complete Reference", Mcgraw Hill Education, Ninth Edition, 2014
2. Mahmoud Parsian, "JDBC Metada, MySQL and Oracle Recipes: A Problem-Solution Approach", Apress Publications, 2006

REFERENCES:

1. Bart Baesens, Aimee Backiel, Seppe Vanden Brocke, "Beginning Java Programming: The Object Oriented Approach", John Wiley & Sons, 2015
2. Daniel Liang, "Introduction to Java Programming, Comprehensive Version", Pearson Education, Ninth Edition, 2014

WEB REFERENCES:

1. https://docs.oracle.com/javase/tutorial/java/index.html
2. http://javabeginnerstutorial.com/core-java/
3. http://www.w3schools.in/java/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3	1	2						1	2
CO2		3	3	3	2						2	2
CO3		3	3	3	2						2	2
CO4		3	3	3	2						2	3
CO5	3	3	3	3	3						3	3

Course Code: 141CS0407	Course Title: DATA STRUCTURES AND ALGORITHM ANALYSIS-II LABORATORY
Core/Elective: Core	L : T : P : C : M – 0 : 0 : 4 : 2 : 100
Type: Practical	Total Contact Hours: 60

Course Outcomes

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

CO1. Implement the tree data structure and its variants and use these in various applications.
CO2. Implement graph traversal algorithms and deploy it in applications
CO3. Apply Greedy and Dynamic programming technique for solving optimization problems
CO4. Employ Backtracking, Branch and Bound approaches for solving combinatorial problems.

LIST OF EXPERIMENTS

1. Implementation of Expression tree
2. Implementation of Heap sort
3. Implementation of Tree structure for dictionary search
4. Implementation of Graph traversal applications
5. Implementation of Greedy algorithms
6. Implementation of Dynamic programming algorithms
7. Implementation of Backtracking algorithms
8. Implementation of Branch and Bound algorithms
9. Mini Project

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2		3		2			2
CO2	3	1	3	2	2				2			3
CO3	3	2	3	3	3		3		2			3
CO4	3	2	3	3	3		3		2			3

Course Code: 141CS0408	Course Title: DATABASE SYSTEMS LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 4 : 2 : 100
Type: Practical	**Total Contact Hours:** 60

Course Outcomes:

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

CO1. Develop ER diagram for any applications
CO2. Populate and query a database using DML/DDL/DCL commands
CO3. Construct the programs using PL/SQL

List of Experiments:

Implement the following concepts for the applications suggested below:

1. ER diagrams
2. DDL,DML,DCL commands
3. SUB QUERY, NESTED SUBQUERY and COMPLEX QUERY using constraints
4. Functions and procedures
5. Cursors and triggers.

The suggested applications are (not limited to):

1. Library Management System
2. College Management System
3. Hospital Management System
4. Railway Reservation System
5. Hotel Management System
6. Employee Management System

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	3	1	1				2	2
CO2	2	2	3	3	2	2		1			2	2
CO3	2	3	3	3	2	1	1				2	2

Course Code: 141CS0409	Course Title: ETHICAL AND MORAL RESPONSIBILITY
Core/Elective: Core	**L : T : P : C : M** – 0 :0 :2 :1 :100
Category: Practical	**Total Contact Hours:** 30

Course Outcomes:

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

CO1. Articulate the importance of ethical and moral responsibilities
CO2. Explain the fundamental aspects of ethical practices
CO3. Validate one's appropriate and inappropriate behaviours in various roles
CO4. Elaborate code of conduct of professional bodies
CO5. Explain the importance of professional practices as a future employee/entrepreneur

UNIT I ETHICAL PRACTICES – IMPORTANCE 8 *

Why ethical practices; The current day scenario of ethical practices – parents, society, politics & business; Awareness of skewedness of information – news, advertisements and other media; The need for ethical and moral responsibility on a personal level; Handling oneself amidst peer pressure and societal pressure;

UNIT II ETHICAL PRACTICES – FUNDAMENTALS 6*

Morality & Ethics; Moral issues, inquiry, moral dilemmas; Moral autonomy – Kohlberg's theory and Gilligan's refinement; Theories on "right action" – virtue ethics, utilitarianism, duty ethics, rights ethics – resolving moral dilemmas; justifying moral obligations;

UNIT III CODES OF CONDUCT 8*

Importance of code of conduct and its role; Evolving draft Code of conduct for different roles – son/daughter, student, future employee & citizen; Reflection on real time incidences at the college.

Engineers as responsible experimenters; Faith of the Engineer (ABET); Pledge and Code of ethics as per National Society of Professional Engineers (NSPE); Code of Ethics of Institution of Engineers (India); Case studies and discussions in professional context

UNIT IV PROFESSIONAL PRACTICES AT WORK 8*

Transition from a student to a professional; Importance of professional practices at work; Integrity as the topmost virtue of a professional; Self-awareness: Where competence ends and professionalism takes over; Professional qualities;

Need to align oneself to culture & values of organizations; Need to embrace diversity in organizations.

*- Includes review sessions

Course handouts (compiled by PS team, MCET)

1. Instructor's Manual (for the faculty)
2. Learner's workbook (for the student)

References:

1. Mike W Martin & Roland Schinzenger, "Ethics in Engineering", Latest Edition, Tata McGraw-Hill
2. Code of conduct document, MCET student handbook
3. Gail D Baura, "Engineering Ethics – an industrial perspective", Academic Press, Elsevier,
4. Subrato Bagchi, "The professional – Defining the new standard of Excellence at work", Penguin Books India

Assessments:

S.No	Test/ Examination	Criterion	Reduced Marks	Remarks
1	Continuous evaluation	Work book entry & self-analysis = 40 % Test (KT &SKT) = 20 % Evaluation of class response = 40 %	60 %	Test conducted just after CCET 3
2	Comprehensive Examination	Test (KT & SKT) = 50 marks Viva – voce = 50 marks	40 %	Conducted at the end of semester by the Execution Faculty member and another senior faculty involved in the course.
		Condition for clearing the course	50%	

No. of hours & credits:

Enablement through class room lecture, case discussions and group presentations	Conducted by trained internal faculty	30 hours – 1 credit
At least two guest lectures	Delivered by senior people from Industries/Government organizations	

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								3	3		1	2
CO2								3	3		1	2
CO3						3		3	3		2	2
CO4						3		3	3		1	2
CO5								3	3		2	2

END OF SEMESTER IV

REGULATION 2014 (Revision 0)

Curriculum and Syllabus for B.E Computer Science and Engineering

SEMESTER V

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS0501	Computer Networks	3	0	0	3	100
140CS0502	Formal Languages and Automata Theory	3	0	0	3	100
140CS0503	System Software Design	3	0	0	3	100
140CS0504	Computer Architecture	3	0	0	3	100
140CS0505	Web Technologies	3	0	0	3	100
140CS0506	Data warehousing and Mining	3	0	0	3	100
PRACTICAL						
140CS0507	Computer Networks Laboratory	0	0	3	2	100
140CS0508	System Software Design Laboratory	0	0	3	2	100
140CS0509	Web Technologies Laboratory	0	0	3	2	100
	TOTAL	**18**	**0**	**9**	**24**	**900**
LIST OF ONE CREDIT COURSES OFFERED						
C# and .NET Programming						
Python Programming						

SEMESTER VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS0601	Artificial Intelligence	3	0	0	3	100
140CS0602	Compiler Design	3	0	0	3	100
140CS0603	Software Quality Assurance and Testing	3	0	0	3	100
140CS0604	Object Oriented System Design	3	0	0	3	100
XXX	Elective – I	3	0	0	3	100
XXX	Elective – II	3	0	0	3	100
PRACTICAL						
140CS0607	Compiler Design Laboratory	0	0	3	2	100
140CS0608	Object Oriented System Design Laboratory	0	0	3	2	100
140CS0610	Mini Project	0	0	3	2	100
	TOTAL	**18**	**0**	**9**	**24**	**900**
LIST OF ONE CREDIT COURSES OFFERED						
Advanced Android Programming						
Advanced Java Programming						
Internet of Things						
Data Analytics using R Tool						

ELECTIVES I & II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS9161	TCP/IP	3	0	0	3	100
140CS9162	Multimedia Systems and Applications	3	0	0	3	100
140CS9163	Advanced Data Structures	3	0	0	3	100
140CS9164	Network Security	3	0	0	3	100
140CS9165	Big Data	3	0	0	3	100
140CS9166	Probability and queuing theory	3	0	0	3	100

SEMESTER VII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS0701	Engineering Economics & Cost Analysis	3	0	0	3	100
140CS0702	Open Source Software Development	3	0	0	3	100
140CS0703	Graphics and Visualization	3	0	0	3	100
XXX	Elective – III	3	0	0	3	100
XXX	Elective – IV	3	0	0	3	100
PRACTICAL						
140CS0707	Open Source Software Development Lab	0	0	3	2	100
140CS0708	Graphics and Visualization Lab	0	0	3	2	100
140CS0810	Project Work (Annual Pattern)	0	0	3	-	100
	TOTAL	**15**	**0**	**9**	**19**	**800**

SEMESTER VIII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS0801	Principles of Management	3	0	0	3	100
XXX	Elective – V	3	0	0	3	100
XXX	Elective – VI	3	0	0	3	100
PRACTICAL						
140CS0810	Project Work (Annual Pattern)	0	0	12	8	200
	TOTAL	**9**	**0**	**12**	**17**	**500**

ELECTIVES III & IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS9170	Professional Ethics	3	0	0	3	100
140CS9171	High Speed Networking	3	0	0	3	100
140CS9172	User Interface Design	3	0	0	3	100
140CS9173	Neural Network and Fuzzy Logic	3	0	0	3	100
140CS9174	Digital Image Processing	3	0	0	3	100
140CS9175	Optimization Techniques	3	0	0	3	100
140CS9176	Virtualization	3	0	0	3	100
140CS9177	Social Network Analysis	3	0	0	3	100
140CS9179	Agile Software Development	3	0	0	3	100

ELECTIVES V & VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CS9181	Distributed Systems Design	3	0	0	3	100
140CS9182	Mobile and Pervasive Computing	3	0	0	3	100
140CS9183	Information Retrieval Techniques	3	0	0	3	100
140CS9184	Graph Theory	3	0	0	3	100
140CS9185	Cyber Security and Cyber Laws	3	0	0	3	100
140CS9186	Business Intelligence	3	0	0	3	100
140CS9187	Information Visualization	3	0	0	3	100
140CS9188	Cloud Technology	3	0	0	3	100

SEMESTER V

Course Code:140CS0501	**Course Title:** COMPUTER NETWORKS
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0306 – OPERATING SYSTEMS

Course Outcomes:

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

CO1. Comprehend the concepts of data communications and Computer Networks.
CO2. Demonstrate functionalities of different layers.
CO3. Describe IEEE standards employed in computer networking and implement routing protocols.
CO4. Design different protocols and network components.
CO5. Illustrate the security over the network and design different application.

Course Content:

UNIT I FOUNDATIONS OF NETWORKS 7

Requirements – Network Architecture – Implementing Network Software – Bandwidth and Latency –Delay X Bandwidth product –Application Performance needs.

UNIT II LINK LAYER 9

Perspectives on Connecting – Encoding (NRZ, NRZI, Manchester, 4B/5B) – Framing (Bit and Byte Oriented Protocols) – Error Detection (Parity, Internet Checksum, CRC) – Reliable transmission – Ethernet and Multiple Access Networks – Wireless

UNIT III INTERNETWORKING 10

Internet Protocol (IP) – Service Model - Global Addresses - Datagram Forwarding in IP – Subnetting and Classless Addressing – ARP – DHCP – ICMP – Routing protocols: RIP and OSPF – IPv6 – Challenges for Mobile Networking – Mobile IP

UNIT IV END-TO-END PROTOCOLS 10

UDP – TCP: Segment Format, Connection Establishment and Termination- Sliding Window Protocol – TCP Extensions – TCP Congestion Control – Congestion Avoidance Mechanisms.

UNIT V SECURITY & APPLICATIONS 9

Cryptographic Building Blocks – Symmetric vs Public-Key Ciphers – Key Management - Transport layer Security – SSL – HTTPS – IPSec – Wireless Security – Firewalls – SMTP – World Wide Web (HTTP) – Web Services – DNS – SNMP

TEXT BOOK:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks – A Systems Approach", 5th Edition, The Morgan Kaufmann Publishers, 2011.

REFERENCES:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A top down Approach Featuring the Internet", 4th Edition, Pearson Education, 2006
2. William Stallings, "Data and Computer Communication", 6th Edition, Pearson Education, 2000.
3. Jochen Schiller, "Mobile Communication", Addison Wesley, 2000

WEB REFERENCES:

- Larry L. Peterson and Bruce S. Davie, "Computer Networks – A Systems Approach", Fifth Edition, The Morgan Kaufmann Publishers, 2011 URL: http://booksite.elsevier.com/9780123850591/
- OPNET Tool :URL: http://www.opnet.com/university_program/itguru_academic_edition
- Lecture Notes. URL: http://nptel.ac.in/courses/IIT-MADRAS/Computer_Networks/
- http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Computer%20networks/New_index1.html/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									√
CO2	√	√	√						√	√		√
CO3	√	√	√	√	√							√
CO4	√	√	√	√	√				√	√		√
CO5	√	√	√	√	√			√	√	√	√	√

Course Code: 140CS0502	**Course Title:** FORMAL LANGUAGES AND AUTOMATA THEORY
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0403 DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS

Course Outcomes:

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

CO1. Design a machine for recognizing Regular Languages
CO2. Construct an automaton for recognizing context free languages
CO3. Understand the concepts of computability theory and design a Turing machine
CO4. Analyze the Time Complexity for Class NP Problems
CO5. Examine the Space Complexity of automaton

Course Content:

UNIT I REGULAR LANGUAGES 9

Automata, Computability and Complexity – Regular Languages: Finite Automata – Non determinism – Regular Expressions – Non regular Languages

UNIT II CONTEXT-FREE LANGUAGES 7

Context-Free Grammars – Pushdown Automata – Non Context-Free Languages

UNIT III COMPUTABILITY THEORY 11

Turing Machines – Variants of Turing Machines – Decidability: Decidable Languages –Undecidability – Reducibility: Undecidable Problems from Language Theory – Post Correspondence Problem – Mapping Reducibility

UNIT IV TIME COMPLEXITY 9

Measuring Complexity – The Class P – The Class NP – NP-completeness – Additional NP-complete Problems

UNIT V SPACE COMPLEXITY 9

Savitch's Theorem – The Class PSPACE – PSPACE-completeness – The Classes L and NL –NL-completeness – NL equals coNL – Approximation Algorithms – Probabilistic Algorithms

TEXT BOOK:

1. Michael Sipser, "Introduction to the Theory of Computation", Cengage Learning, Thomson Asia, 3rd Edition, 2013.

REFERENCES:

1. E.Hopcroft, J.D.Ullman, "Introduction to Automata Theory, Languages and Computation",Pearson, Education Publishers, 3rd Edition, 2008.
2. Kamala Krithivasan and R. Rama, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, Delhi, 1st Edition, 2009.

WEB REFERENCES:

- Formal languages and automata theory. URL: http://www.ics.uci.edu/~goodrich/teach/cs162/notes/
- http://nptel.ac.in/courses/106106049/
- JFLAP tool -Home. URL: www.jflap.org/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√		√							
CO2	√	√	√		√							
CO3	√	√	√	√								√
CO4	√	√		√								√
CO5	√	√		√								√

Course Code: 140CS0503	**Course Title:** SYSTEM SOFTWARE DESIGN
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0402-MICROPROCESSOR SYSTEMS AND INTERFACING

Course Outcomes:
At the end of the course the student should be able to:
CO1. Identify the relationship between system software and machine architecture.
CO2. Design and implement the different type of assemblers
CO3. Design and implement the linkers and loaders
CO4. Construct a macro processors and illustrate software tools
CO5. Inspect and characterize the architecture of Virtual Machines.

Course Content:

UNIT I MACHINE ARCHITECTURE 8

Evolution of the components of a Programming system - General Machine Architecture - Machine Language - Assembly language – Language Processors

UNIT II ASSEMBLERS 9

Elements of an Assembly Language Programming- Simple Assembly Scheme- Pass structure of Assemblers- Design of a two pass assembler – A single pass Assembler-Case study: IBM PC

UNIT III LOADERS AND LINKERS 10

Loader Schemes- Design of an absolute loader- Design of a direct linking loader – Relocation and linking concepts – Design of a linker – Self Relocating Programs- Linking for overlays.

UNIT IV MACROPROCESSORS & SOFTWARE TOOLS 9

Macro Definition and Call- Macro Expansion- Nested Macro Calls- Advanced Macro facilities-Design of a Macro processor. Software tools for Program development- Editors- Debug monitors – Programming Environments- User Interfaces

UNIT V VIRTUAL MACHINES 9

Introduction to Virtual Machines (VM) – Pascal P-Code VM – Object-Oriented VMs – Java VMArchitecture

TEXT BOOKS:

1. Dhamdhere D M, "Systems Programming and Operating Systems", Tata McGraw HillPublishing Company, New Delhi, 2nd revised edition 2009.
2. John J Donovan, “Systems Programming”, Tata McGraw Hill Publishing CompanyLimited, New Delhi, 2009.
3. James E.Smith and Ravi Nair, “Virtual Machines”, Elsevier, 2005

REFERENCES:

1. Leland L Beck, "System Software- An Introduction to System Programming", PearsonEducation, New Delhi, 3rd edition, (6th Impression) 2007.
2. J.Nithyashri, “System Software”, Tata Mc-graw Hill Publishing Company Limited, New Delhi, 2nd Edition 2010.

WEB REFERENCES:

- System software and Design. URL: elearning.vtu.ac.in/CS51.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									√
CO2	√	√	√	√								√
CO3	√	√	√	√								√
CO4	√	√	√		√		√			√		√
CO5	√	√		√		√						√

Course Code: 140CS0504	**Course Title:** COMPUTER ARCHITECTURE
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0402 -MICROPROCESSOR SYSTEMS AND INTERFACING

Course Outcomes:

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

CO1. Describe the organization, addressing and architectural components of a computer
CO2. Compare the functionality and performance of various processor families
CO3. Infer the characteristics of multiprocessing and parallel processing systems
CO4. Illustrate the concept of pipelining and address the crosscutting issues
CO5. Demonstrate Instruction Level Parallelism with dynamic scheduling

Course Content:

UNIT I INTRODUCTION 9

Basic structure of computers - machine instruction - memory allocation and address -instructions, sequencing. Accessing I/O devices - interrupts - DMA Buses - Interface Circuits -Standard I/O interfaces.

UNIT II BASIC PROCESSING UNIT AND PROCESSOR FAMILIES 9

Fundamental concepts - multiple bus organization - superscalar operation - Ultra SPARC II. Embedded system - processor chips – microcontroller - programming considerations. Processor families - overview of ARM Family and Intel Family.

UNIT III LARGE COMPUTER SYSTEM 9

Parallel processing - Array Processor - Structure of General Purpose Multiprocessors -Interconnection Networks - Parallelism & shared variable - Multi computers – Programmers view of shared memory & Message passing - Amdahl's Law.

UNIT IV PIPELINING 9

Introduction - The Major Hurdle of pipelining - pipeline Hazards - Pipelining Implementation -Extending the MIPS pipeline to handle multicycle operations - Overview of MIPS R4000Pipeline - crosscutting issues.

UNIT V INSTRUCTION - LEVEL PARALLELISM 9

Concepts and Challenges - Basic Compiler Techniques for Exposing ILP - Reducing Branch Costs with Prediction - Overcoming Data Hazards with Dynamic Scheduling - Examples and the Algorithm - Hardware Based Speculation - Exploiting ILP Using Multiple Issue and Static Scheduling, Dynamic Scheduling and Speculation.

TEXT BOOKS:

1. Carl Hamacher, Zvonok Vranesic Safwat Zaky, "Computer Organization", 5th edition, McGraw Hill, 2002.
2. John L. Hennessey and David A. Patterson, "Computer Architecture: A Quantitative Approach", 5th Edition, Elsevier, 2011.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture -Designing for Performance", Pearson Education, 9th Editi on, (Hardcover Revised) 2012.
2. David A. Patterson and John L. Hennessey, "Computer Organization and design, The Hardware/Software Interface", 4th Edition, Morgan Kaufmann, 2009.
3. John P.Hayes, "Computer Architecture and Organization", 3rd edition, McGraw Hill, 2002.
4. B.Govindarajalu, "Computer Architecture and Organization", 2nd edition, McGraw Hill, 2010.

WEB REFERENCES:

- Carl Hamacher, Zvonok Vranesic Safwat Zaky, "Computer Organization", 5th edition, McGraw Hill, 2002. URL: http://www.technolamp.co.in/2011/04/computer-organization-carl-hamacher.html
- Carl Hamacher, Zvonok Vranesic Safwat Zaky, "Computer Organization", 5th edition, McGraw Hill,2002.URL:http://www.cse.iitk.ac.in/users/karkare/courses/2011/cs220/html/notes.html
- John L. Hennessey and David A. Patterson, "Computer Architecture: A Quantitative Approach", 5th Edition,Elsevier,2011.URL:https://books.google.co.in/books/about/Computer_Architecture.html?id=v3-hVwHnHwC&hl=en
- NPTEL: Computer Science and Engineering- "Computer Architecture". URL: http://www.nptel.ac.in/courses/106102062/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√		√			√	√	√		√
CO2	√	√	√		√	√			√	√	√	√
CO3		√	√	√	√				√	√	√	√
CO4	√	√	√	√	√		√		√	√	√	√
CO5		√	√	√	√			√	√	√	√	√

Course Code: 140CS0505	**Course Title:** WEB TECHNOLOGIES
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0305 – JAVA PROGRAMMING

Course Outcomes:

At the end of the course the student will be able to:
CO1. Create web pages with various XHTML concepts and JavaScript features.
CO2. Construct web pages using dynamic scripting languages.
CO3. Outline the concepts of XML and apply its features in web.
CO4. Demonstrate the JSP and ASP scripting language.
CO5. Illustrate Servlets along with its features.

Course Content:

UNIT I XHTML - JAVA SCRIPT 8

Internet and World Wide Web – XHTML –Lists- Forms- Cascading style sheets-JAVA Script –Memory Concepts- Control Statements – Functions – Arrays – Objects.

UNIT II DYNAMIC HTML 9

Object Referencing- Collections- Dynamic Style- Dynamic Position- Event Model– Form Processing – Event Bubbling – Filters and Transitions – Flip Filters –Shadows –Gradients – Data Binding – Record Set

UNIT III XML 9

XML Markup- Namespaces-Document Type Definitions-Schema-Document Object Model-XML Path Language –Extensible Style Sheet Language – XLink- XPointer - XInclude – Xbase.

UNIT IV JSP-ASP 10

JSP - Objects – Scripting – Standard Actions – Directives - ASP – Page Objects – File System Objects – Session Tracking and Cookies – ADO –Active-X Components – Form Navigation –Posting Messages.

UNIT V SERVLETS 9

HTTP Servlet – Servlet Life Cycle –Caching- Retrieving Information- HTML Information –Session Tracking-URL Rewriting-Cookies-Security-Applet Servlet Communication - Collaboration.

TEXT BOOK:

1. Deitel & Deitel, Goldberg, "Internet and World Wide Web – How to Program", Pearson Education Asia, 3rd Edition (Reprint) 2005.
2. Deitel & Deitel ,Nieto , Lin ,Sadhu, "XML: How To Program", Pearson Education Asia, 2nd Edition 2009.
3. Jason Hunter, William Crawford,"Java Servlet Programming",O'Reilly Publication, 2nd Edition 2010

REFERENCES:

1. Eric Ladd, Jim O' Donnel, "Using HTML 4, XML and JAVA", Prentice Hall of India – QUE, Platinum Edition, 2001.
2. Ramesh Bangia, Web Technology (including HTML, CSS, XML, ASP, JAVA), Firewall Media, 1st Edition (Reprint) 2008.

WEB REFERENCES:

- http://xwiki.usc.edu/groups/instructionalmaterials/weblog/e5657/XHTML_and_CSS_tutorial.html
- http://www.w3schools.com/html/html_xhtml.asp

- https://www.ischool.utexas.edu/technology/tutorials/webdev/xml_dtds/xml.pdf
- http://www.ceng.metu.edu.tr/~e1195288/JSP_tutorial.pdf
- http://www.java-programming.info/tutorial/pdf/csajsp2/02-Servlet-Basics.pdf
- http://www.nptel.ac.in/courses/106105084/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√				√	√	√		√
CO2	√	√	√	√				√	√	√		√
CO3	√	√	√	√				√	√	√		√
CO4	√	√	√	√	√			√	√	√		√
CO5	√	√	√	√	√			√	√	√		√

Course Code: 140CS0506	**Course Title:** DATA WAREHOUSING AND DATA MINING
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0404 - DATABASE SYSTEMS

Course Outcomes:

At the end of the course the student should be able to:
CO1. Determine the components of data warehouse and OLAP techniques.
CO2. Apply the Data Pre-processing techniques and demonstrate the association rule mining process.
CO3. Analyze the different methods and issues in Classification Techniques.
CO4. Illustrate the techniques for clustering the data and detection of outliers
CO5. Identify the techniques for mining heterogeneous data sources such as Text, Multimedia and Spatial data.

Course Content:

UNIT I DATA WAREHOUSING 8
Basic Concepts, Modeling: Data cube and OLAP, Design and Usage, Implementation, Data Generalization by Attribute-Oriented Induction.

UNIT II DATA PREPROCESSING AND ARCHITECTURE 8
Overview of data mining, Patterns, Technologies, Issues in data mining, Data Objects and Attribute Types,
Preprocessing: Cleaning, Integration, Reduction, Transformation, Discretization

UNIT III ASSOCIATION RULE MINING 9
Association Rule Mining: Basics, Frequent Itemset Mining Methods, Pattern Evaluation Methods. Pattern Mining in Multilevel, Multi-Dimensional Space, Constraint–based Frequent Pattern Mining

UNIT IV CLASSIFICATION 10
Basics, Decision Tree Induction, Bayesian Classification, Rule Based Classification, Model Evaluation and Selection, Classification by back propagation, Other Classification Methods

UNIT V CLUSTERING 10
Cluster Analysis, Partitioning methods, Hierarchical methods, Outlier Analysis and Detection Methods
RECENT TRENDS- Spatial Data Mining, Multimedia Data Mining, Text Mining, Data Mining Applications.

TEXT BOOK:
1. Jiawei Han, MichelineKamber and Jian Pei, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012.

REFERENCES:
1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education 2004.
2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, 10th Reprint 2007.
3. David Hand, HeikkiMannila, Padhraic Smyth, "Principles of Data Mining", PHI 2004.
4. W.H.Inmon, "Building the Data Warehouse", 3rd Edition, Wiley, 2003.

WEB REFERENCES:

- Han and Kamber: Data Mining --- Concepts and Techniques, 2nd ed., Morgan Kaufmann, 2006. URL: http://web.engr.illinois.edu/~hanj/bk3/bk3_slidesindex.htm
- DATA MINING CLASSIFICATION. URL: http://courses.cs.washington.edu/courses/csep521/07wi/prj/leonardo_fabricio.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√							
CO2	√	√	√	√	√							√
CO3	√	√		√	√							√
CO4	√	√	√		√	√	√					√
CO5	√		√		√		√					√

Course Code: 140CS0507	**Course Title:** COMPUTER NETWORKS LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

At the end of the course the student should be able to:
CO1: Design various LAN topologies and evaluate the performance
CO2: Implement socket programming
CO3: Develop various routing protocols
CO4: Design and Monitor a computer Network.

List of experiments:

The following experiments are to be implemented/ simulated using any of the following tools

- Network Simulator (latest version) and OPNET

1. Simulation of IEEE LAN topologies
2. Building a network topology with proper connectivity
3. TCP and UDP Socket programming
4. Remote Method Invocation and Remote Procedure Call.
5. Implementation of Routing Protocols
6. Study of router configuration
7. Dynamic Host Configuration Protocol.
8. Sliding Window Protocol
9. TCP Congestion Control algorithms
10. Implementation of SNMP protocol.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√		√							√
CO2	√	√	√		√							√
CO3	√	√	√		√							√
CO4	√	√	√	√	√			√				√

Course Code: 140CS0508	**Course Title:** SYSTEM SOFTWARE DESIGN LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

At the end of the course the student should be able to:
CO1: Design a single pass and two pass assembler
CO2: Implement a Macro processor
CO3: Design absolute and re-locatable loader
CO4: Implement a text editor.

List of Experiments:

1. Implementation of a symbol table.
2. Design of a two pass assembler.
3. Design of a one pass assembler.
4. Design of a macro processor.
5. Implementation of an absolute and relocating loader.
6. Implement pass one and pass two of a direct-linking loader.
7. Implementation of a simple text editor.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									√
CO2	√	√	√									√
CO3	√	√	√									√
CO4	√	√	√					√				√

Course Code: 140CS0509	**Course Title:** WEB TECHNOLOGIES LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

At the end of the course the student should be able to:
CO1. Construct the dynamic websites with all kinds of tags.
CO2. Illustrate the various concepts of XML.
CO3. Demonstrate with example the concepts of objects using JSP &ASP, components of the Active X objects and HTTP Servlets.
CO4. Develop a project by applying web application technologies and services

List of Experiments

1. Create a website using HTML tags and Cascading style sheets.
2. Implement the java script functions and objects.
3. Implement the Client Side Scripting for Validating the Web Form Controls using DHTML
4. Implement the concepts of XML Schema and DTD
5. Implement the concepts of XML Style Sheet and XLink
6. Implement the concepts of JSP Objects
7. Implement the concepts of ASP objects
8. Implement the Active X components
9. Implement the HTTP Servlets

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			√		√							√
CO2			√		√							√
CO3			√		√							√
CO4			√		√							√

SEMESTER VI

Course Code: 140CS0601	**Course Title:** ARTIFICIAL INTELLIGENCE
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0403 DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS

Course Outcomes:

At the end of the course the student will be able to:
CO1. Understand the fundamental concepts of Artificial Intelligence.
CO2. Apply efficient search techniques for Problem Solving
CO3. Devise Knowledge Representation scheme and apply Inference rules
CO4. Interpret the working of various Learning methods
CO5. Apply Artificial Intelligence techniques in Real world systems

Course Content:

UNIT I INTELLIGENT AGENTS 9
Artificial Intelligence: Definition – History – Intelligent Agents – Problem Solving Agents – Toy Problems and Real-world Problems – Searching for Solutions - Uninformed Search Strategies

UNIT II PROBLEM SOLVING 9
Informed Search Strategies: Greedy best-first search – A* search – Heuristic functions – Local search Algorithms and Optimization problems – Online Search Agent – Constraint Satisfaction Problems – Adversarial Search

UNIT III KNOWLEDGE REPRESENTATION 9
Propositional Logic – Reasoning Patterns in Propositional Logic – First Order Logic – Inference in First Order Logic

UNIT IV LEARNING 9
Learning from Observations – Forms of Learning – Learning Decision – Ensemble Learning – A Logical Formulation of Learning – Knowledge in Learning – Explanation Based Learning – Learning using Relevance Information – Inductive Logic Programming

UNIT V PLANNING AND APPLICATIONS 9
The Planning Problem – Planning with State-Space Search – Partial-Order Planning – Conditional Planning. Applications: Communication as action – Formal grammar for English – Information Retrieval – Information Extraction – Speech Recognition

TEXT BOOK:
1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Prentice Hall, 3rd Edition, 2010.

REFERENCES:
1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, 2nd Edition 2003.
2. Patrick Henry Winston, "Artificial Intelligence", Pearson Education / PHI, 2004.

WEB REFERENCES:
- Tool:SWI-Prologhttp://www.swi-prolog.org/downloadhttp://www.swi-prolog.org/pldoc/man?section=quickstart
- AIMA (Artificial Intelligence: A Modern Approach) http://aima.cs.berkeley.edu/ - TEXT BOOK: followedhttp://aima.cs.berkeley.edu/code.html - online code repository C++, Java, Python, LISP
- E Learning courses from IITs and IIIShttp://nptel.ac.in/video.php?subjectId=106105079 – Video Lecture by Prof P. Dasgupta
- MITOPENCOURSEWARE http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/ - Video Lecture by Prof. Patrick Henry Winston
- Learn and explore the concepts in AI –AIspace tool developed at Laboratory of computational Intelligence at University of British Columbia.http://www.aispace.org/index.shtml

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√								
CO2	√	√	√	√								
CO3	√	√	√	√	√		√					
CO4	√	√	√									√
CO5	√	√	√				√			√		√

Course Code: 140CS0602	**Course Title:** COMPILER DESIGN
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):

140CS0502- FORMAL LANGUAGES AND AUTOMATA THEORY

Course Outcomes:

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

CO1. Describe the phases of compilers, tools and working of a compiler.
CO2. Design and implement a lexical analyzer
CO3. Analyze and develop different types of parsers
CO4. Choose schemes to develop intermediate code and memory space allocation.
CO5. Validate various techniques of code optimization and generation.

Course Content:

UNIT I INTRODUCTION 9

Structure of a Compiler - Applications of Compiler Technology. A Simple Syntax – Directed Translator - syntax definition, syntax-directed translation, Parsing, A translator for simple expressions, Symbol Tables.

UNIT II LEXICAL ANALYSIS 9

The role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of Tokens, Finite Automata, Regular expression to an Automata, Optimization of DFA- Based Pattern Matchers.

UNIT III SYNTAX ANALYSIS 9

Context-free grammars, Top-Down Parsing, Bottom-up parsing, Introduction to LR parsing, Powerful LR Parsers.

UNIT IV INTERMEDIATE CODE GENERATION 9

Variants of Syntax Trees, Three – Address Code, Types and Declarations, Translation of Expressions, control flow, Back patching, Switch Statement. **Run-time environments:** Storage organization, stack-allocation of space.

UNIT V OPTIMIZATION &CODE GENERATION 9

Machine-Independent Optimization: The principal sources of optimization, Loops in flow graph

Code Generation: Issues in the design of a code generator, Target Language, Address in the Target code, Basic Block and flow graph. DAG representation of Basic Blocks, A simple code generator, Peephole Optimization. Register allocation and Assignment.

TEXT BOOK:

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman – Compiler Principles, Techniques and Tools, 2nd Edition, Pearson Education – 2012.

REFERENCES:

1. Keith Cooper, Linda Torczon – "Engineering a Compiler" - Elsevier ,2nd Edition , 2012
2. Steven S. Muchnick – Advanced Compiler Design & Implementation – Harcourt Asia, Morgan Kaufmann – 2010.
3. J. P. Bennet - Introduction to Compiling Techniques- Tata McGraw-Hill Publishing- 2002.

WEB REFERENCES:

- Introduction to Machine Independent Optimization URL: http://nptel.ac.in/courses/106108052/17
- The Static Single Assignment Form URL: http://nptel.ac.in/courses/106108052/31

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									√
CO2	√	√	√	√	√							√
CO3	√	√	√		√							√
CO4	√	√	√	√								√
CO5	√		√	√								√

Course Code: 140CS0603	**Course Title:** SOFTWARE QUALITY ASSURANCE AND TESTING
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0406 PRINCIPLES OF SOFTWARE ENGINEERING

Course Outcomes:

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

CO1. Identify and explain various models, tools, and approaches for software quality control
CO2. Describe quality related activities such as quality tasks, planning, documentation, reviews and audits for software processes
CO3. Design and execute various Software testing techniques
CO4. Compare and evaluate various levels and types of software testing
CO5. Illustrate and explain various types of object oriented software testing activities

Course Content:

UNIT I SOFTWARE QUALITY AND CONTROL 10

Software Quality – Hierarchical models of Boehm and McCall – Quality measurement –Metrics measurement and analysis – Gilb's approach – GQM Model. Tools for Quality – Ishikawa's basic tools – CASE tools.

UNIT II SOFTWARE QUALITY ASSURANCE 10

SQA versus software quality control - Various Components of SQA system-overview -Quality tasks – SQA plan – Teams – Documentation control– Reviews and Audits.

UNIT III TESTING STRATEGIES AND METHODS FOR TEST CASE DESIGN 9

Introduction to test case design strategies, Black box approach - Random testing, equivalence class partitioning, boundary value analysis, cause effect graphing, state transition testing, White box approach - white box approach to test design, test adequacy criteria, coverage and control flow graphs, covering code logic, data flow and white box test design, loop testing, mutation testing.

UNIT IV LEVELS OF TESTING 8

Levels of testing: Need for testing levels, Unit test, Integration testing, System Testing- Functional testing, Performance testing, Stress testing, Configuration testing, Security testing Recovery testing, Regression testing, Alpha, Beta and Acceptance tests

UNIT V OBJECT ORIENTED TESTING 8

Issues in object oriented testing, Class testing, object oriented integration testing, GUI Testing and Object oriented system testing.

TEXT BOOKS:

1. Allan C. Gillies, "Software Quality: Theory and Management", Thomson Computer press, 2nd Edition, 2003.
2. Stephen H.Kan, "Metrics and models in software quality Engineering", Addison –Wesley, 2nd Edition, 2003.
3. Daniel Galin, "Software Quality Assurance: From Theory to Implementation", Addison-wesley, 2009.
4. Ilene Burstein "Practical Software testing- A process oriented approach", 8th Indian reprint 2010.

REFERENCES:

1. Paul C. Jorgensen "Software Testing, A Craftsman's Approach", 3rd Edition, 4th Indian reprint 2012.
2. Allan C. Gillies, "Software Quality: Theory and Management", Thomson Computer press, 3rd Edition, 2011.

WEB REFERENCES:

- Software Testing Concepts: http://www.tutorialspoint.com/software_testing/
- Testing Levels: http://www.cs.uky.edu/~paulp/CS499/CS499testingnotes.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√				√					√	√	√
CO2	√					√				√	√	
CO3	√	√									√	
CO4	√	√	√		√						√	
CO5	√	√	√		√						√	

Course Code: 140CS0604	**Course Title:** OBJECT ORIENTED SYSTEM DESIGN
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0406 - PRINCIPLES OF SOFTWARE ENGINEERING

Course Outcomes:

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

CO1. Describe the essence of object-oriented software processes and outline the usage of general purpose modeling language in the field of software Engineering

CO2. Illustrate Object Oriented Analysis and to analyze the functional requirements for a system

CO3. Construct UML diagrams to model various aspects of the systems

CO4. Relate object oriented concepts to all stages of the software development life cycle

CO5. Develop software using object oriented approach (modeling objects from the real world and then using the model to build a language independent design.)

Course Content:

UNIT I INTRODUCTION TO OBJECT ORIENTATION 9

Software related problems, software Engineering concepts, development activities, Introduction to Object Orientation - Development – Themes - Evidence for Usefulness of OO Development-OO modeling history.

UNIT II MODELING CONCEPTS 9

Modeling -Abstraction-The Three Models-Class Modeling-State Modeling, Interaction Modeling

UNIT III ADVANCED MODELING CONCEPTS 9

Advanced Class Modeling, Advanced State Modeling, Advanced Interaction Modeling

UNIT IV ANALYSIS AND DESIGN 10

Process overview, System conception, Domain Analysis, Application Analysis, System Design, Class Design

UNIT V IMPLEMENTATION 8

Implementation Modeling – OO languages, Databases, Programming Style

Case Study: ARENA System

TEXT BOOKS:

1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", 3rd Edition, Pearson Education Asia, 2010.
2. Michael Blaha, James Rumbaugh "Object-Oriented Modeling and Design with UML", 2nd Edition, Pearson Education, 5th impression 2009

REFERENCES:

1. Ali Bahrami, "Object Oriented System Development" , Tata McGraw-Hill , 2nd Reprint 2008.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The unified Modeling language user guide", 2nd Edition, Pearson Education, 4th Reprint 2008.
3. James Rumbaugh,Ivar Jacobson, Grady Booch, "The Unified Modeling Language Reference Manual", Second Edition Pearson Education , 4th Reprint 2009.

WEB REFERENCES:

- Michael Blaha, James Rumbaugh "Object-Oriented Modeling and Design with UML", Second Edition, Pearson Education, Fifth impression 2009 https://books.google.co.in/books?id=wirmoiviloYC&pg=PA67&lpg=PA67#v=onepage&q&f=false
- Material: http://people.aub.edu.lb/~ws06/OOCourse.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√								
CO2	√	√	√	√					√	√		
CO3	√	√	√	√	√				√	√		√
CO4	√	√	√	√					√	√		
CO5	√	√	√	√				√	√	√	√	√

Course Code: 140CS0607	**Course Title:** COMPILER DESIGN LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

At the end of the course, the students should able to:
CO1. Design and implementation of the Front end phase of the compiler.
CO2. Construction of Front end phase using LEX and YAAC tool
CO3. Generation of Intermediate code from the Front end phase
CO4. Implementation of Back end phase of the compiler

LIST OF EXPERIMENTS:

1. Construction of NFA from a given regular expression.
2. Construction of minimized DFA from a given regular expression.
3. Lexical Analysis using LEX.
4. Implementation of Shift Reduce Parsing Algorithm.
5. Construction of LR Parsing Table.
6. Syntax Analysis using YACC.
7. Intermediate code generation.
8. Implementation of Code Optimization techniques.
9. Implementation of Code Generation Phase.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√					√			√
CO2	√		√		√				√			√
CO3	√	√	√	√					√			√
CO4	√	√	√	√					√			√

Course Code: 140CS0608	**Course Title:** OBJECT ORIENTED SYSTEM DESIGN LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

At the end of the course the student will be able to:
CO1: Design SRS.
CO2: Construct UML Diagrams and Implement it
CO3: Generate Test cases for the developed system.
CO4: Prepare Requirement, analysis, design and testing documents

For any 2 Applications

I Preparation of SRS and construction of the following diagrams
1. Activity diagram.
2. Use Case diagram.
3. State diagram.
4. Sequence diagram.
5. Collaboration diagram.
6. Class diagram.
7. Deployment diagram.
8. Package diagram.
9. Code generation.
10. Forward and reverse engineering.

II Test Plan, Test case Generation and documentation

Suggested Applications:
Automatic Teller Machine – Library Management System – Inventory Control System – e-shopping system – ARENA System, Ticket Reservation System, Quiz system ,Examination Management system, Course Management system.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√			√		√		√
CO2	√	√	√	√	√			√				√
CO3	√	√	√	√	√			√				√
CO4	√	√	√	√	√			√		√		√

ELECTIVES

Course Code: 140CS9161	**Course Title:** TCP/IP
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s): 140CS0501–COMPUTER NETWORKS

Course Outcomes:

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

CO1. Characterize and interpret the significance of using Internet Protocol and Transmission Control Protocol.
CO2. Demonstrate the functionality of client and server systems using socket programming
CO3. Identify and illustrate various TCP/IP functionalities used in wireless and ATM systems
CO4. Formulate the required TCP functionalities in higher level application layer protocols
CO5. Develop security solutions in various levels of network communication

Course Content:

UNIT I ADDRESSING AND RELIABILITY 11

IP – Addressing – Sub-netting and Super-netting; The TCP/IP Protocol Suite – Versions – Port address – Communication – Services – Flow control – Silly window syndrome – Error control – Timers Congestion control – Connection – Operation and Package

UNIT II SOCKET INTERFACE 7

Client Server Model – Concurrency – Processes – Sockets – Byte Ordering – Address Transformation and Manipulation – System calls – Iterative Server – Concurrent Server – Client and Server programmes

UNIT III TCP/IP OVER WIRELESS & ATM 9

BOOTP and DHCP – Mobile IP – Addressing – Agent Discovery – Registration – Data Transfer – ATM WANS – Cells – Routing Cells – ARP – LIS – Real Time Traffic over Internet

UNIT IV APPLICATION LAYER PROTOCOLS 10

Domain Name System – Telnet – Rlogin – FTP – TFTP – Simple Mail Transfer Protocol - Hyper Text Transfer Protocol

UNIT V INTERNET SECURITY 8

Privacy – Digital Signature – Security in the Internet – Transport Layer security – Security at the IP layer – Firewalls – Private Networks – NAT – IPv6

TEXT BOOK:

1. Behrouz A. Forouzan, "TCP/IP Protocol suite", Tata McGraw Hill, 2010, 4th Edition.

REFERENCES:

1. Douglas E. Comer, "Internetworking with TCP/IP", 4th Edition, Pearson Education Asia, Volume 1,2 2000.
2. Richard Stevens, "TCP/IP Illustrated", Vol. 1,2,3, Pearson Education India, 1996.
3. John Ray, "Using TCP/IP", Prentice Hall of India, 1999

WEB REFERENCES:

- IIT Madras, National Programming on Technology Enabled Learning (NPTEL) – Data Communications – TCP/IP. URL: http://nptel.ac.in/courses/106105082/35
- Virtual and Software Training- TCP/IP for windows course URL: http://www.vtc.com/products/TCP/IP-for-Windows-tutorials.htm
- EPA University - TCP/IP Networking. URL: http://moodle.epfl.ch/course/view.php?id=523

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√			√	√			√	√	√	√
CO2		√	√	√								√
CO3	√	√	√	√	√	√		√		√	√	√
CO4	√	√	√	√	√			√	√	√	√	√
CO5	√	√	√	√	√		√	√	√	√	√	√

Course Code: 140CS9162	**Course Title:** MULTIMEDIA SYSTEMS AND APPLICATIONS
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes:

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

CO1. Demonstrate a step-by-step approach to multimedia systems design

CO2. Explain in detail multimedia Image compression standards, Lossless and lossy compression algorithms.

CO3. Devise Video Compression Techniques

CO4. Illustrate the issues related to generic multimedia databases, to describe programming issues at different levels and cover object based and object oriented approaches

CO5. Depict application related issues: media design, general user-interface topics & multimedia learning, discuss on various possible applications and experiment with a case study

Course Content:

UNIT I MULTIMEDIA AUTHORING AND DATA REPRESENTATION 8

Introduction – components of Multimedia- Multimedia and Hypermedia-WWW- Multimedia software tools- Multimedia authoring and Tools- Graphics and Data Representations – Image data types – Popular File formats

UNIT II MULTIMEDIA DATA COMPRESSION 10

Basics of Information theory-Lossless Compression Algorithms – Run Length Encoding- Variable Length Encoding- Dictionary Based Coding- Arithmetic coding – Lossy Compression Algorithms – Distortion Measures – Rate Distortion theory – Quantization – Transform coding- Image Compression standards

UNIT III VIDEO COMPRESSION TECHNIQUE 9

Basic Video compression Techniques- Video compression based on motion compensation- search for motion vectors –H.261 – MPEG Video Coding – MPEG-I and 2

UNIT IV MULTIMEDIA DBMS AND PROGRAMMING 9

Multimedia specific properties of MMDBMS-Data modeling in MMDBMS- Implementation-Abstraction levels – requirement for Programming Languages – Object Oriented Application development – Object Oriented Frameworks and Class Libraries

UNIT V MULTIMEDIA APPLICATION DESIGN 9

Design specific properties of Images – Visualization –symbols- Illustrations-Image production techniques – User Interfaces – Multimedia Learning-Applications: Media preparation- Editing – Integration – Transmission- Usage – Electronic Books and Magazines-Kiosks- Tele-shopping- Entertainment

TEXT BOOKS:

1. Ze-Nian Li Mark S. Drew," Fundamentals of Multimedia", Pearson Education,2007
2. Ralf Steinmetz KlaraNahrstedt," Multimedia Applications", Springer 2007

REFERENCES:

1. John.F. Koegel Buford, "Multimedia Systems ", Pearson Education, 6th Impression 2009.
2. Tay Vaughon, "Multimedia making it works, "McGraw-Hill Education 2010
3. Ralf Steinmetz and Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education, 6th Impression 2009.

WEB REFERENCES:

- Multimedia Systems:http://link.springer.com/book/10.1007%2F978-3-662-08878-4

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									
CO2	√	√	√	√								
CO3	√	√	√		√					√		
CO4	√	√	√							√		
CO5	√	√	√							√		

Course Code: 140CS9163	**Course Title:** ADVANCED DATA STRUCTURES
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course:
140CS0304–DATA STRUCTURES

Course Outcomes:

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

CO1. Develop algorithms for efficient search using Tree data structures
CO2. Analyze the working of Priority Queue and its variations
CO3. Identify the need for Disjoint Sets and deploy them in real world problems
CO4. Develop Range Search applications using suitable data structures
CO5. Design applications using Geometric Data structures

Course Content:

UNIT I SEARCH DATA STRUCTURES **10**

Top-Down Splay Trees – Red Black Trees - Treaps – Skip Lists – Tries – Suffix Arrays and Trees

UNIT II PRIORITY QUEUE DATA STRUCTURES **8**

Binary Heap – *d*-Heaps – Leftist Heaps – Skew Heaps – Binomial Queues – Fibonacci Heaps

UNIT III DISJOINT SET ADT **9**

Basic Data Structure – Smart Union Algorithms – Path Compression – Analysis – Application

UNIT IV RANGE SEARCH **9**

1-Dimensional Range Searching – kd-Trees – Range Trees – Higher-Dimensional Range Trees

UNIT V GEOMETRIC DATA STRUCTURES **9**

Interval Trees – Priority Search Trees – Segment Trees – Quad Trees

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures & Algorithms in Java", Pearson Education, 3rd Edition, 2012.
2. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, "Computational Geometry Algorithms and Applications", Springer, 3rd Edition, 2008.

REFERENCES:

1. Peter Brass "Advanced Data Structures", Cambridge University Press, 1st Edition, 2008.
2. Dinesh P.Mehta, Sartaj Sahni, "Handbook of Data Structures and Applications", Chapman & Hall/CRC, 2005.

WEB REFERENCES:

- Adrian Vladu and CosminNegruşeri, Suffix arrays – a programming contest approach, 2005. URL: http://web.stanford.edu/class/cs97si/suffix-array.pdf
- Applications of Computational Geometry – Geometry in Action. URL: https://www.ics.uci.edu/~eppstein/geom.html
- Data Structure Visualizations URLs:https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
- http://visualgo.net/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√		√					√
CO2	√	√		√	√		√			√		√
CO3	√	√	√	√	√				√		√	√
CO4	√	√	√	√	√		√		√		√	√
CO5	√	√	√	√	√				√		√	√

Course Code: 140CS9164	**Course Title:** NETWORK SECURITY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0401- DISCRETE MATHEMATICS and 140CS0501-COMPUTER NETWORKS

Course Outcomes:

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

CO1. Comprehend and describe the OSI Security Architecture X.800 and use classical encryption/decryption techniques.
CO2. Explain the various modes of operation for block ciphers as well as the various types of symmetric key ciphers.
CO3. Apply number theory and explain a variety of public key cryptographic systems.
CO4. Explain the different types of message authentication and cryptographic hash functions.
CO5. Choose and evaluate techniques for enhancing security on the cloud, web, email, and computer network.

Course Content:

UNIT I INTRODUCTION 9

Introduction – Computer Security Concepts – Security Services, Mechanisms and Attacks – OSI Security Architecture - Basic cryptography - Classical Encryption Techniques: Transposition and Substitution, Caesar Cipher.

UNIT II SYMMETRIC CIPHERS 9

Stream Ciphers vs Block ciphers – Block cipher design principles - Modes of operation: Electronic Code Book, Block Chaining, Counter Mode – Data Encryption Standard (DES) and DES Example – AES: Structure and Key Expansion. Contemporary Ciphers: Multiple DES, RC4 and RC5, Blowfish.

UNIT III PUBLIC KEY ENCRYPTION 9

Introduction to number Theory – Fermat's and Euler's Theorem - Primality testing-factorization –Chinese remainder theorem - Discrete logarithms - RSA Cryptosystem - Diffie-Hellman Key Exchange - Rabin Cryptosystem - Elgamal Cryptosystem.

UNIT IV MESSAGE AUTHENTICATION AND HASH FUNCTIONS 9

Message authentication: Requirements and Functions, Security of MACs – Cryptographic Hash Functions —MD5, SHA, HMAC. Digital Signatures: Elgamal, Schnorr – Kerberos - X.509.

UNIT V NETWORK SECURITY AND SYSTEM SECURITY 9

Network Access Control and Cloud Security: Cloud Security Risks and Countermeasures, Data Protection in Cloud, Cloud Security as Service – Web Security: SSL, TLS, HTTPS – e-mail security: PGP, S/MIME – IP Security: Overview, Policy, and ESP.

TEXT BOOK:

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Pearson Education, New Delhi, 6th edition 2013.

REFERENCES:

1. Behrouz A Forouzan, "Cryptography and Network Security", The McGraw-Hill Companies, Special Indian Edition 2007.
2. Roberta Bragg, Mark Phodes - Ousley, Keith Strassberg, "Network Security: The Complete Reference", Tata McGraw-Hill edition 2004.
3. AtulKahate "Cryptography and Network security", Tata McGraw-Hill Publications Company Ltd. New Delhi, 2nd edition, 2009.

WEB REFERENCES:

- Cryptography. URL: http://williamstallings.com/Cryptography/
- Network Security Protocols: A Tutorial - IETF. URL: https://www.ietf.org/proceedings/61/slides/sectut-0/editorstrain.ppt
- X.800 : Security architecture for Open Systems Interconnection for CCITT applications. URL: http://www.itu.int/rec/T-REC-X.800-199103-I/e
- US-CERT Security Trends Report: 2012 in Retrospect. URL: https://www.us-cert.gov/sites/default/files/US-CERT_2012_Trends-In_Retrospect.pdf
- A simple introduction to NS concepts. URL: http://ptgmedia.pearsoncmg.com/images/1587131625/samplechapter/1587131625content.pdf
- NPTEL: Computer Science and Engineering - Cryptography and Network Security (Video Tutorials). URL: http://www.nptel.ac.in/courses/106105031/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√				√				√		√
CO2	√	√	√									
CO3	√	√	√									
CO4	√	√	√									
CO5	√				√	√				√		√

Course Code: 140CS9165	**Course Title:** BIG DATA
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0306- OPERATING SYSTEMS and 140CS0404- DATABASE SYSTEMS

Course Outcomes:

At the end of the course the student should be able to:
CO1. Define Big Data and identify applications for Big Data
CO2. Describe and explain the HADOOP framework with HDFS architecture.
CO3. Comprehend the anatomy of MapReduce and explain how a MapReduce job runs.
CO4. Run MapReduce jobs on a Hadoop framework.
CO5. Use Hadoop related tools including Pig, Hive, and HBASE for data analytics.

Course Content

UNIT I BIG DATA and ANALYTICS 8

Big Data - Volume, Velocity, Variety, Veracity – Big Data Analytics Applications – Architecture Components: Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting, Data Privacy Protection, Real-time Adaptive Analytics – Google BigTable and BigQuery – Amazon S3.

UNIT II HADOOP AND HDFS 10

Hadoop - Data Storage and Analysis, Comparison with Other Systems, Apache Hadoop, Hadoop Ecosystem, Hadoop Releases. Design of Hadoop Distributed File System (HDFS), HDFS Concepts, CLI, Filesystems and Interfaces, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives. Hadoop I/O - Data Integrity, Compression, Serialization, File-Based Data Structures.

UNIT III MapReduce 10

MapReduce – Weather Dataset: Analysis with Unix Tools and Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes. Classic vs YARN MapReduce: Anatomy of Job Run, Failures, Scheduling, Shuffle and Sort.

UNIT IV ADVANCED MapReduce 9

MapReduce Types and Formats – Types, Input Formats, Output Formats. MapReduce Features – Counters, Sorting, Joins, Side Data Distribution, MapReduce Library Classes.

UNIT V TOOLS 8

Pig: Comparison with Databases, Pig Latin – Hive: Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions – Hbase: Hbasics, Concepts, HBase Versus RDBMS.

TEXT BOOK:

1. ArvindSathi, “Big Data Analytics: Disruptive Technologies for Changing the Game (Paperback)”, Mc Press, 2013.
2. Tom White, “Hadoop: The Definitive Guide, O’Reilly Publication and Yahoo!Press”, 2009.

REFERENCES:

1. Viktor Mayer-Schönberger and Kenneth Cukier, “Big Data: A Revolution That Will Transform How We Live, Work, and Think, Eamon Dolan/Houghton Mifflin Harcourt”, 2013.

WEB REFERENCES:

- Google BigQuery, URL: https://developers.google.com/bigquery/sign-up?csw=1#queries
- Amazon S3, URL:http://aws.amazon.com/s3/
- Welcome to Apache™ Hadoop®! URL: https://hadoop.apache.org/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√											
CO2	√				√							√
CO3	√				√							√
CO4	√				√							√
CO5	√		√		√							√

Course Code: 140CS9166	**Course Title:** PROBABILITY AND QUEUEING THEORY
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
140CS0401- Discrete Mathematics

Course Outcomes:

At the end of the course the student should be able to:
CO1: Apply the basics concepts of probability in real life problems.
CO2: Apply the concepts standard probability distributions in real time problems.
CO3: Develop the knowledge in handing random variables.
CO4: Solve and formulate the random process by probabilistic model.
CO5: Solve the real time problems using the knowledge queuing theory.

Course Content:

UNIT I PROBABILITY AND RANDOM VARIABLE 9

Axioms of Probability – Conditional Probability – Total Probability – Baye's Theorem– Random- variable – Probability mass function – Probability density function – Properties – Moments –Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS 10

Discrete distributions: Geometric-Negative Binomial - Continuous distributions: Uniform – Exponential –Normal distributions and their properties (Proofs excluded).

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression –Transformation of random variables – Central limit theorem.

UNIT IV RANDOM PROCESSES AND MARKOV CHAINS 9

Classification – Stationary process – Markov process – Poisson process – Birth and death process –Markov chains – Transition probabilities.

UNIT V QUEUEING THEORY 8

Markovian models – M/M/1 – M/M/C – finite and infinite capacity (steady state solutions only) – M/G/1 queues – Pollaczek – Khintchine formula.

TEXT BOOKS:

1. Ross S, "A first course in probability", 9th Edition, Pearson Education, 2012.
2. Veerarajan. T, "Probability, Statistics and Random Processes", 2nd Edition, Tata McGraw Hill, 11th reprint 2007.
3. Taha. H. A., "Operations Research-An Introduction", 9th Edition, Pearson Education Edition, 2010.

REFERENCES:

1. S.Karlin and H.M. Taylor., "An Introduction to Stochastic Modeling" Academic Press, 2007.
2. Richard A Johnson, "Probability and Statistics for Engineers", 7th Edition, Pearson Education, 2005.
3. Gross D. and Harris, C.M., "Fundamentals of Queuing Theory", 4th Edition, John Wiley and Sons, 2008.

WEB REFERENCES:

- http://nptel.ac.in/video.php?subjectId=106106094
- http://nptel.ac.in/syllabus/syllabus.php?subjectId=111104028
- http://nptel.ac.in/syllabus/syllabus.php?subjectId=111106052
- http://www.nptelvideos.in/2012/11/discrete-mathematical-structures.html
- http://nptel.ac.in/courses/111103020/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√	√	√							
CO2	√	√		√	√							
CO3		√			√							
CO4	√	√	√	√	√							
CO5	√	√	√		√							

REGULATION 2011

Curriculum and Syllabus for B.E Computer Science and Engineering

SEMESTER VII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
11CS701	Engineering Economics & Cost Analysis	3	0	0	3	100
11CS702-R	Open Source Software Development	3	0	0	3	100
11CS703	Graphics and Visualization	3	0	0	3	100
XXX	Elective – III	3	0	0	3	100
XXX	Elective – IV	3	0	0	3	100
PRACTICAL						
11CS706-R	Open Source Software Development Lab	0	0	3	2	100
11CS707	Graphics and Visualization Lab	0	0	3	2	100
11CS810	Project Work (Annual Pattern)	0	0	3	-	100
	TOTAL	**15**	**0**	**9**	**19**	**800**

SEMESTER VIII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
11CS801	Principles of Management	3	0	0	3	100
XXX	Elective – V	3	0	0	3	100
XXX	Elective – VI	3	0	0	3	100
PRACTICAL						
11CS810	Project Work (Annual Pattern)	0	0	12	8	200
	TOTAL	**9**	**0**	**12**	**17**	**500**

ELECTIVES III & IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
11CS970	Professional Ethics	3	0	0	3	100
11CS971	High Speed Networking	3	0	0	3	100
11CS972	User Interface Design	3	0	0	3	100
11CS973	Neural Network and Fuzzy Logic	3	0	0	3	100
11CS974	Digital Image Processing	3	0	0	3	100
11CS975	Optimization Techniques	3	0	0	3	100
11CS976	Virtualization	3	0	0	3	100
11CS977	Social Network Analysis	3	0	0	3	100
11CS979	Agile Software Development	3	0	0	3	100

ELECTIVES V & VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
11CS981	Distributed Systems Design	3	0	0	3	100
11CS982	Mobile and Pervasive Computing	3	0	0	3	100
11CS983	Information Retrieval Techniques	3	0	0	3	100
11CS984	Graph Theory	3	0	0	3	100
11CS985	Cyber Security and Cyber Laws	3	0	0	3	100
11CS986	Business Intelligence	3	0	0	3	100
11CS987	Information Visualization	3	0	0	3	100
11CS988-R	Cloud Technology	3	0	0	3	100

SEMESTER VII

Course Code: 11CS701	**Course Title:** ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes:

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

CO1. Define and describe the basic terminologies and concepts related to economics.
CO2. Outline the various functions of production and analyze using pricing methods.
CO3. Perform cost estimation for material, labor, and different type of jobs.
CO4. Understand and use the various costing methods for operations, processes, and other factors.
CO5. Employ techniques such as balance sheet, average rate of return, payback period, and net present value for accounting.

Course Content:

UNIT I INTRODUCTION **9**

Objectives of Managerial Economics, Firm, Cost Estimation, Costing, Cost Accounting, Factors Influencing Managerial Decisions & Theoretical Concepts, Classification and Elements of cost

UNIT II PRODUCTION ANALYSIS AND PRICING **9**

Production Function-Least Cost Combination of Inputs-Factor Productivities & Return to Scale-Determinants of Price-Pricing under different objectives and Market Structures-Price Discrimination & Pricing methods in practice

UNIT III ESTIMATION **9**

Estimation of Material, Labor and Overhead Cost, Allocation of Overheads. Estimation for different types of jobs

UNIT IV COSTING **9**

Job Costing - Operating Costing - Process Costing - Standard Costing (Variance Analysis) GDP

UNIT V ACCOUNTING **9**

Balance Sheet - Profit & Loss Statement - Evaluation of Investment decisions – Average Rate of Return-Payback Period-Net Present Value & IRR

TEXT BOOKS:

1. Jawaharlal, Cost Accounting, Tata McGraw-Hill company, 1996.
2. T.P.Banga&S.C.Sharma, Mechancial Estimating and Costing, Khanna Publishers, 1984

REFERENCES:

1. James.C.Van Home, "Fundamentals of fincancial Management", PHI, NewDelhi, 2004.
2. V.L.Mote, Samuel Paul &G.S.Gupta, Managerial Economics-Concepts & Cases, TMH, Co, NewDelhi, 1989.
3. Ramachandran Aryasry&VV.Ramana Murthy, Engg Economics & Financial Accounting, Tata McGraw-Hill company, NewDelhi, 2004

WEB REFERENCES:

- URL: http://web.stevens.edu/ecosys/eng_eco/index.html
- URL: http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=110101003
- URL: http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=110101005

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√				√					√	√
CO2	√	√				√						√
CO3	√	√	√									√
CO4	√	√										√
CO5	√	√			√							√

Course Code: 11CS702-R	**Course Title:** OPEN SOURCE SOFTWARE DEVELOPMENT
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes:

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

CO1. Outline the open source licenses and contractual issues and also design open source Databases.
CO2. Develop an object oriented program using groovy language
CO3. Combine groovy and grails framework for developing a Mini project.
CO4. Propose an idea for developing a concept using ruby
CO5. Combine ruby and rails framework for developing a Mini project.

Course Content:

UNIT I OPEN SOURCE SOFTWARE & DATABASE DESIGN 9

OPEN SOURCE SOFTWARE: Open Source Initiatives – definition-Open Source Licenses- Legal Issues-Contractual Protections SQL Database : MYSQL- Data types –stored programs NoSQL database :MongoDB – Schema-less, Database, collections, documents, fields, Establish relationships - Create, retrieve, update and delete documents.

UNIT II OPEN SOURCE PROGRAMMING LANGUAGE: GROOVY 9

Groovy as extension of Java - Data types, control structures, special loops & operators- List, Map, String, Date – Closure- Object Oriented groovy-Builders-working with databases

UNIT III OPEN SOURCE PROGRAMMING FRAMEWORK: GRAILS 9

Grails Introduction – commands-Web system evolution – Data Layer- scaffolding – Injection Attacks-Plugin-Unit and integration testing-Service layer

UNIT IV RUBY 9

Ruby Introduction –variables –objects-numbers and expression-Text and strings-Arrays and List-Ruby application development-Object orientation basics-Databases

UNIT V RAILS 9

Rails on the web-web style-controlling data flow: Controllers and models – scaffolding and REST-Models with forms-model relationships

TEXTBOOKS:

1. Michael R.Overly," The Open Source Handbook", 1st Edition, A BNA Company, 2003
2. Paul Dubios, "MYSQL – Developers Library", 4th Edition,2008
3. Kristina Chodorow, Michael Dirolf, "MongoDB: The Definitive Guide Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publication, 2010
4. Bashar Jawad, "Groovy and Grails Recipes", 1st Edition, A Press Publication, 2008
5. Peter Cooper," Beginning Ruby: From Novice to Professional", A press Publication, 2009
6. Simon St. Laurent, Edd Dumbill, "Learning Rails", 1st Edition, O'Reilly Publication, 2008

REFERENCES:

1. Jim Shingler, Joseph Faisal Nusairat, Christopher M. Jud, Beginning Groovy and Grails: From Novice to Professional, First Edition, APress Publication, 2008.

WEB REFERENCES:

- Open Source Initiative : http://opensource.org/
- MySQL: https://www.safaribooksonline.com/library/view/mysql-fifth-edition/9780133038552/pref01.html
- Groovy: http://www.groovy-lang.org/
- Grails Framework: https://grails.org/
- Ruby Programming Language: https://www.ruby-lang.org/en/
- Ruby on Rails : http://rubyonrails.org/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√			√				√		
CO2	√	√	√	√	√				√	√	√	√
CO3	√	√	√	√	√				√	√	√	√
CO4	√	√	√	√	√				√	√	√	√
CO5	√	√	√	√	√				√	√	√	√

Course Code: 11CS703	**Course Title:** GRAPHICS AND VISUALIZATION
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CO102 ENGINEERING MATHEMATICS – I
11CO109 ENGINEERING GRAPHICS

Course Outcomes:

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

CO1. Outline the core concepts of Graphics and apply OpenGL API to create Interactive Computer Graphics.
CO2. Illustrate Graphics primitives & attributes and implement it using OpenGL API.
CO3. Distinguish the relationship between 2D and 3D versions of geometrical transformation & clipping algorithms and apply OpenGL API for performing operations.
CO4. Interpret 3D viewing concepts and representation.
CO5. Discriminate visible surface detection methods and select the models for lightning &surface rendering.

Course Content:

UNIT I GRAPHICS SYSTEMS 8

Survey of Computer Graphics – Overview of Graphics Systems–Basic OpenGL Syntax-Related Libraries-Header Files- Complete OpenGL Program- Coordinate Reference Frames-Specifying a Two-Dimensional World Coordinate Reference Frame in OpenGL-OpenGL Point functions- Line functions-Line Drawing Algorithms-Parallel Line Algorithms.

UNIT II GRAPHICS OUTPUT PRIMITIVES AND ATTRIBUTES 9

OpenGL Curve Functions-Circle And Ellipse Generating Algorithm- Fill Area Primitives- Polygon Fill Areas, OpenGL Functions, Attributes Of Output Primitives

UNIT III 2D and 3D GRAPHICS 9

2D Basic Geometric Transformations, Matrix Representation, Composite Transformation, Reflection, Shearing, 2D Viewing and Clipping algorithms, 3D Basic Geometric Transformations.

UNIT IV 3D VIEWING AND REPRESENTATION 10

3D viewing: Concepts, Projection Transformations, Orthogonal Projections, Parallel Projections and Perspective Projections, OpenGL 3D Viewing functions, 3D Object Representation: Polyhedra, OpenGL functions, Curved surfaces, quadric surfaces, Spline representation, Bezier Curve and surfaces, Octrees, BSP Trees, Fractal Geometry methods

UNIT V VISUALIZATION OF 3D OBJECTS 9

Visible surface detection methods: Classification of algorithms, Back Face Detection, Depth Buffer, A Buffer, Scan Line method, Depth sorting, BSP Tree method, Area subdivision, Octree method-Ray casting, OpenGL functions-**Illumination Models**: Light sources, Surface Lighting methods , Basic Illumination models, Polygon Rendering methods, OpenGL Illumination functions

TEXTBOOK:

1. D. Hearn and M. Pauline Baker, Computer Graphics with OpenGL, Pearson Education, 3rd Edition, 2009

REFERENCES:

1. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics,2nd Edition 24th reprint, McGraw-Hill International Edition, 2013.
2. F. S. Hill Jr., Computer Graphics using OpenGL, PH, 2007
3. Edward Angel, Interactive Computer GraphicsA Top-Down Approach with OpenGL, 5th Edition, Addison-Wesley, 2008.
4. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Second Edition in C, Pearson Education, 2003.
5. Mason Woo, Jackie Neider, Tom Davis, Dave Shreiner ,OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 1.2, Open GL Architecture Review Board, Pearson Education, First Indian Reprint 2000.

WEB REFERENCES:

- OpenGL API
  - https://www.opengl.org/
  - https://www.opengl.org/resources/libraries/glut/ - GLUT downloads

- Tutorials – Game Development
  - http://nehe.gamedev.net/
  - https://www.opengl.org/archives/resources/code/samples/s2001/ - Nate Robins tutorial

- OpenGL Programming Guide
  - http://www.glprogramming.com/red/
- OpenGL Reference Manual
  - http://www.glprogramming.com/blue/
- E Learning Course from IIT and IISC
  - http://nptel.ac.in/courses/106102065/ - Video Lecture notes by Prof Prem K Kalra
- MITOPENCOURSEWARE
  - http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-graphics-fall-2012/ - Video Lecture Prof. Wojciech Matusik, Prof. Frédo Durand

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√							
CO2	√	√	√	√								
CO3	√	√	√	√								
CO4	√	√		√	√							
CO5	√	√	√	√	√							

Course Code: 11CS706-R	**Course Title:** OPEN SOURCE SOFTWARE DEVELOPMENT LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes:

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

CO1. Develop web applications with PHP as front end and MongoDB as backend.
CO2. Implement the OOP principles using Groovy
CO3. Write programs in GROOVY and develop applications in GRAILS framework.
CO4. Implement web-based applications in RAILS framework using RUBY.

Areas of Experiments:

- Develop a webpage using PHP and open source databases by validating the certain fields
- Implementation of Database using MONGO
- Groovy text parsing, regular expressions, and SQL
- Framework using Grails
- Ruby OOPs concepts and Databases
- Framework using rails

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			√		√							√
CO2			√		√							√
CO3			√		√							√
CO4			√		√							√

Course Code: 11CS707	**Course Title:** GRAPHICS AND VISUALIZATION LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Course Outcomes

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

CO1. Outline and apply graphics built-in functions in designing and creating simple animation.
CO2. Analyze the algorithms for displaying output primitives and construct complex objects.
CO3. Develop menu driven graphics by combining output primitive algorithms, transformation operations & viewing principles.
CO4. Create projects by conceiving and applying graphics fundamentals.

Areas of Experiments:

1. Implementation of graphics built-in functions
2. Implementation of Line Drawing Algorithms.
3. Implementation of Circle and Ellipse drawing Algorithms
4. Implementation of 2D and 3D Transformation
5. Implementation of 2D clipping
6. Visualizing 3D objects.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			√		√							√
CO2			√		√							√
CO3			√		√							√
CO4			√		√							√

SEMESTER VIII

Course Code:11CS801	**Course Title:** PRINCIPLES OF MANAGEMENT
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes:

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

CO1. Define the concept of management and discuss why organizations are needed, why managers are necessary, and why management is a challenge.

CO2. Explain why planning is needed in organizations and why long-term objectives are necessary for successful planning and Identify the essential characteristics of decision making.

CO3. Differentiate between the various types of organizational structures and patterns. Explain the importance of delegation in organizations and describe the relationship between authority, responsibility and accountability.

CO4. Analyze the leadership function, recognizing leadership as the relationship between a supervisor and subordinates in an organizational environment.

CO5. Recognize the link between planning and controlling, and the various means by which managers measure and compare performance to objectives. Explain why financial controls are used by organizations as the predominant means of control

UNIT I INTRODUCTION 9

Historical developments –approaches to management– Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization

UNIT II MANAGERS & ENVIRONMENT 9

Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies & Planning Premises- Forecasting Techniques – Decision-making

UNIT III FUNCTIONAL AREA ORGANIZATION 9

Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process – Techniques

UNIT IV MOTIVATION & DIRECTIONS 9

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication-Types

UNIT V CONTROLLING STRATEGIES 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TEXTBOOKS:

1. Harold Koontz & Heinz Weihrich "Essentials of Management"- Tata McGraw- Hill-7th Edition-2007.
2. Tripathy PC and Reddy PN, "Principles of Management"- Tata McGraw-Hill 1999.

REFERENCES:

1. Maheswari S N," Principles of management accounting" Sultan hand&sons 2003
2. Vilas Bagad," Principles of Management", technical publishers,2006.

WEB REFERENCES:

- http://catalog.flatworldknowledge.com/bookhub/reader/5?cid=41991&e=carpenter-ch01
- http://www.nios.ac.in/media/documents/VocInsServices/m1-4f.pdf
- http://discovery.bits-pilani.ac.in/dlpd/courses/coursecontent/courseMaterial/mgtszc211/principles_of_management_notes.pdf
- http://faculty.mercer.edu/jackson_r/Ownership/chap02.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							√	√	√		√	√
CO2			√	√				√				
CO3				√		√		√	√	√	√	
CO4					√	√			√	√		
CO5			√	√	√	√	√					√

ELECTIVES

Course Code: 11CS970	**Course Title:** PROFESSIONAL ETHICS
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS201–COMMUNICATION SKILLS

Course Outcomes:

At the end of the course the student should be able to:
CO1. Characterize the fundamental principles and theories in Engineering Ethics
CO2. Define the code of ethics that shape the ethical behavior of the engineer
CO3. Identify the various methods for assessment of Risk Benefit Policies
CO4. Illustrate the significance of societal responsibilities, Loyalty and Professional Rights
CO5. Exhibit professional ethics in society and devise ethical norms for societal and Technological development

Course Content:

UNIT I ENGINEERING ETHICS 9

Senses of Engineering Ethics –The Negative and the Positive face of Engineering Ethics-Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy–The Problems of many Hands–Kohlberg's theory–Gilligan's theory of impediments to Responsible Action–Consensus and Controversy–Professions and Professionalism–Professional Ideals and Virtues –Theories about Right Action-Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics –Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – Columbia Space Shuttle Explosion

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk –Assessment of safety and risk- Social and Value dimensions of Technology- Technology Pessimism –The Perils of Technological Optimism–The Promise of Technology –Computer Technology Privacy and Social Policy–Risk Benefit Analysis– the Three Mile Island and Chernobyl case studies

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Whistle Blowing-Employee Rights –Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics –Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors– Moral Leadership –Honesty – Integrity and Ingenuity Sample Code of Conduct like ABET, AAES, ASME, ASCE, IEEE, NSPE, Institution of Engineers (India), etc.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", 3rd Edition, McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics–Concepts and Cases", Thompson Learning, 2000.

REFERENCES:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. Gail D.Baura, "Engineering Ethics: An Industrial Perspective", Elsevier Inc, 2006
3. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
4. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

WEB REFERENCES:

- Mike Martin and Roland Schinzinger, "Ethics in Engineering", Third Edition, McGraw Hill, New York, 2005. URL : http://course.sdu.edu.cn/G2S/eWebEditor/uploadfile/20131018102149728.pdf
- Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000 URL:http://www.course.sdu.edu.cn/G2S/eWebEditor/uploadfile/20131017113053223.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√					√	√	√	√	√		√
CO2	√					√	√	√	√	√		√
CO3	√	√		√	√	√	√	√	√	√	√	√
CO4	√					√	√	√	√	√	√	
CO5	√	√	√	√	√	√	√	√	√	√	√	√

Course Code: 11CS971	**Course Title:** HIGH SPEED NETWORKING
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS501 – COMPUTER NETWORKS

Course Outcomes:

At the end of the course the student should be able to:
CO1. Differentiate the principal services and applications of high speed networking technologies.
CO2. Distinguish the functionalities of various access and traffic control algorithms used in High Speed networks.
CO3. Analyze the properties of packet scheduling and queuing mechanisms
CO4. Characterize the flow and congestion control mechanisms for the applications' desired QoS
CO5. Illustrate the properties of various differentiated services and their applications

Course Content:

UNIT I NETWORK TECHNOLOGIES 8
Network Technologies - QoS Parameters – Control Methods – Deterministic Bound – Call Admission Control for ATM VBR services and Integrated Services Internet

UNIT II TRAFFIC ACCESS CONTROL 9
ATM Traffic Contract and Control Algorithms – Cell delay variation tolerance – Generic Cell Rate Algorithm – Shaping Multiplexer – Integrated Packet Shaper

UNIT III PACKET SCHEDULING AND QUEUING 12
Packet Scheduling Techniques – Packet fair Queuing – RAM –Based Search Engine – General Shaper and Scheduler – Buffer Management

UNIT IV FLOW AND CONGESTION CONTROL 9
Window based Flow Control – Rate-based Flow Control – Predictive Control Mechanism – Flow Control in ATM and TCP/IP Networks – QoS Routing in ATM and Integrated Services

UNIT V DIFFERENTIATED SERVICES 8
SLA and TCA – Architecture – PHB – Conceptual Model – Multiprotocol Labeled Switching – Architecture – Label Distribution and Forwarding Model – Support - Applications

TEXT BOOK:

1. H. Jonathan Chao, XiaoleiGuo, "Quality of Service Control in High-Speed Networks", John Wiley & Sons, Inc, 2002

REFERENCES:

1. James P. G. Sterbenz, Joseph D. Touch, "High Speed Networking – A Systematic Approach to High- Bandwidth Low-Latency Communication", John Wiley Publications, 2002
2. William Stallings, "High Speed Networks and Internets – Performance and Quality of Service", Pearson Education, 2nd Edition.
3. Benny Bing, "High Speed Wireless ATM and LANs", Artech House Publications, 2000

WEB REFERENCES:

- William Stallings, Technical Resources and Course Web Site for High-Speed Networks and Internet. URL: http://www.williamstallings.com/HsNet2e.html
- Classle Learning – High speed Networks-problems and solutions. URL: https://www.classle.net/content-page/high-speed-networks-problems-n-solutions
- Johns Hopkins University, High-Speed Networking Technologies. URL: https://ep.jhu.edu/programs-and-courses/605.473-high-speed-networking-technologies
- A Course on High Speed Networks. URL: https://3cs1101vu.wordpress.com/about/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√									√
CO2		√			√	√						√
CO3	√	√	√	√				√			√	√
CO4		√	√	√	√		√				√	√
CO5		√	√	√		√			√	√		√

Course Code: 11CS972	**Course Title:** USER INTERFACE DESIGN
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS406– PRINCIPLES OF SOFTWARE ENGINEERING

Course Outcomes:

At the end of the course the student should be able to:
CO1. Distinguish various interaction styles
CO2. Comprehend the effect of interfaces on emotions
CO3. Design effective interfaces and evaluate their performance
CO4. Understand various aspects related to mobile interface design
CO5. Design well organized Web interfaces

Course Content:

UNIT I CONCEPTUAL INTERACTION 9

Problem space and Conceptualizing Design – Conceptual Models – Interface Metaphors – Interaction types – Cognitive Aspects – Social Interaction – Conversations – Social Phenomena

UNIT II EMOTIONS AND INTERFACES 9

Emotions and the User Experience – Expressive Interfaces – Frustrating Interfaces – Persuasive Technologies and Behavioral Change – Anthropomorphism and Zoomorphism – Models of Emotion – Interfaces – Natural User Interface

UNIT III INTERACTION DESIGN & EVALUATION 9

The Process of Interaction Design – Issues – Requirements Gathering – Analysis – Interpretation and Presentation -Evaluation Types – The Evaluation Framework – Usability Testing – Experiments – Field Studies

UNIT IV MOBILE HCI 9

Mobile Ecosystem: Platforms–Application frameworks– Types of Mobile Applications– Mobile Information Architecture– Mobile Design–Elements of Mobile Design–Tools.

UNIT V WEB HCI 9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow, In Page Editing, Static Invitations, Dynamic Invitations.

TEXT BOOKS:

1. Yvonne Rogers, Helen Sharp, Jenny Preece, "Interaction Design: Beyond Human - Computer Interaction", John Wiley & Sons Ltd, 3rd Edition, 2011
2. Brian Fling, "Mobile Design and Development", O'Reilly Media Inc., 1st Edition , 2009
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", O'Reilly, 1st Edition, 2009.

REFERENCES:

1. Jenifer Tidwell, "Designing Interfaces", O'Reilly Publications, 2nd Edition, 2011
2. Wilbert O. Galitz, "An Essential Guide to User Interface Design", John Wiley & Sons Ltd, 3rd Edition, 2007.

WEB REFERENCES:

- User Interface Design and Implementation--- http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes
- Interaction Design. URL: http://www.idc.iitb.ac.in/academics/Interaction-design-course-content.htm

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√					√						
CO2	√			√		√						√
CO3	√		√	√	√	√	√		√	√	√	√
CO4	√					√						√
CO5	√		√		√	√	√		√		√	√

Course Code: 11CS973	**Course Title:** NEURAL NETWORKS AND FUZZY LOGIC
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS601 – ARTIFICIAL INTELLIGENCE

Course Outcomes:

At the end of the course the student should be able to:
CO1. Comprehend the concepts related to neural networks and their functioning
CO2. Distinguish between various Supervised and Unsupervised learning neural network architectures and use them in real world problems
CO3. Understand the functioning of Associative Memory Networks
CO4. Distinguish classical and fuzzy set concepts
CO5. Design Fuzzy Reasoning Systems

Course Content:

UNIT I NEURAL NETWORKS 9

Soft Computing Techniques – Neural Networks: Concept & Evolution – Models – Terminologies– McCulloch-Pitts Neuron – Linear Separability – Hebb Network – Supervised Learning Networks: Perceptron – Adaline – Madaline – Back-propagation network – Radial Basis Function network

UNIT II UNSUPERVISED LEARNING NETWORKS 9

Fixed Weight Competitive Nets – Kohonen Self–Organizing Feature Maps – Learning Vector Quantization – Counter propagation Networks – Adaptive Resonance Theory Network

UNIT III ASSOCIATIVE MEMORY NETWORKS 9

Auto-associative and Hetero-associative Memory Networks – Bidirectional Associative Memory– Hopfield Networks – Special Networks: Simulated Annealing Network – Boltzmann Machine

UNIT IV FUZZY LOGIC 9

Classical Sets and Fuzzy Sets – Classical Relations and Fuzzy Relations – Tolerance and Equivalence Relations – Membership Functions: Features –Fuzzification – Membership Value Assignment – Defuzzification: Lambda Cuts and Defuzzification Methods

UNIT V FUZZY REASONING 9

Fuzzy Arithmetic – Fuzzy Measures – Measures of Fuzziness – Fuzzy Rule Base and Approximate Reasoning: Fuzzy Propositions – Fuzzy Rules – Fuzzy Reasoning – Fuzzy Inference Systems

TEXTBOOK:

1. S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, Wiley India Ltd., 1st Edition, 2007.

REFERENCES:

1. Laurene Fausette, "Fundamentals of Neural Networks", Pearson Education, New Delhi, 2004.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley, 3rd Edition, 2010.
3. S.Rajasekaran, G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications”, PHI Learning Pvt. Ltd., 2004.

WEB REFERENCES:

- Kohonen Self Organizing Maps. URL: http://www.ai-junkie.com/ann/som/som1.html
- Boltzmann Machines. URL: http://www.scholarpedia.org/article/Boltzmann_machine
- Classical Sets and Fuzzy Sets. URL: http://www.atp.ruhr-uniochum.de/rt1/syscontrol/node116.html
- Fuzzy arithmetic. URL: http://reference.wolfram.com/applications/fuzzylogic/Manual/9.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√										√
CO2	√	√	√	√	√		√		√	√	√	
CO3	√	√										
CO4	√	√								√		√
CO5	√	√	√	√	√		√		√		√	√

Course Code:11CS974	**Course Title:** DIGITAL IMAGE PROCESSING
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS962-Multimedia systems and applications

Course Outcomes

At the end of the course the student should be able to:
CO1. Describe the concepts in acquiring, storing and Processing of images
CO2. Illustrate the image quality enhancement techniques.
CO3. Extract the images features and Analyze it.
CO4. Illustrate the techniques for the image compression.
CO5. Demonstrate the case studies of Image Processing

Course Content

UNIT I FOUNDATIONS OF IMAGE PROCESSING 9

Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization –Pixel Relationships – Color Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT –Smoothing and Sharpening filters – Homomorphic Filtering.

UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS 9

Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection –Thresholding – Region Based Segmentation – Morphological Watersheds – Motion Segmentation, Feature Extraction and Analysis.

UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSION 9

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms. Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

UNIT V APPLICATIONS OF IMAGE PROCESSING 9

Image Classification – Image Recognition – Image Understanding – Video Motion Analysis –Image Fusion – Steganography – Digital Compositing – Mosaics – Color Image Processing.

TEXT BOOK:

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2009.

REFERENCES:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", 2nd Edition, Thomson Learning, 2001
2. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI, 2006.
3. Sanjit K. Mitra, & Giovanni L. Sicuranza, "Non Linear Image Processing", Elsevier, 2007
4. Richard O. Duda, Peter E. HOF, David G. Stork, "Pattern Classification" Wiley Student , 2006.
5. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing Using MATLAB", 2nd Edition, Pearson Education, 2010.

WEB REFERENCES:

- Introduction to Digital Image processing URL: http://nptel.ac.in/courses/106105032/
- http://nptel.ac.in/courses/117105079/,http://nptel.ac.in/courses/117104069/,http://nptel.ac.in/courses/117102060/
- Multimedia processing URL: http://nptel.ac.in/courses/117105083/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									
CO2	√	√	√	√	√							
CO3	√	√	√	√	√							
CO4	√	√	√									
CO5	√	√	√									

Course Code: 11CS975	**Course Title:** OPTIMIZATION TECHNIQUES
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11AU301 ENGINEERING MATHEMATICS III and 11CS601 ARTIFICIAL INTELLIGENCE

Course Outcomes:

At the end of the course the student should be able to:
CO1. Formulate and solve Optimization problems using Linear Programming
CO2. Apply PERT/CPM on Activity Network models
CO3. Comprehend about Evolutionary Computation principles
CO4. Apply Evolutionary Optimization techniques to Real world problems
CO5. Understand the working of Swarm Intelligence approaches for Optimization

Course Content:

UNIT I LINEAR PROGRAMMING 9
General linear programming problem - Formulation-Simplex method - General Transportation Problem – Vogel's Approximation method-Transportation algorithm by MODI method

UNIT II NETWORK SCHEDULING BY PERT/CPM 9
Network and basic components - Network construction - Critical path Analysis - PERT computations – Crashing and resource leveling

UNIT III EVOLUTIONARY COMPUTATION 9
Conventional Optimization and Search Techniques - Genetic Algorithms: Biological Background – Simple Genetic Algorithm – Terminology – Encoding – Genetic Operators – Convergence – Working of GA – Fitness Scaling

UNIT IV EVOLUTIONARY OPTIMIZATION 9
Multi-objective Reliability Design – Combinatorial Optimization - Scheduling Problems - Transportation Problems – Network Design and Routing

UNIT V SWARM INTELLIGENCE 9
Particle Swarm Optimization: Background – Operations – Applications. Ant Colony Optimization: Real Ants and Artificial Ants – Characteristics – Algorithms – Applications

TEXTBOOKS:
1. Taha, H. A., "Operations Research-An Introduction", 9th Edition, Pearson Education, 2010.
2. Sivanandam S.N., Deepa S.N., "Introduction to Genetic Algorithms", Springer, 2008.

REFERENCES:
1. KantiSwarup, P.K.Gupta, Man Mohan, "Operations Research", 10th Edition, Sultan Chand & Sons, 2002.
2. Sumathi, S., Surekha, P., "Computational Intelligence Paradigms Theory and Applications using MATLAB", CRC Press, 2010.

WEB REFERENCES:
- Particle swarm optimization. URL:http://ci.cs.up.ac.za/chapter16.pdf
- Genetic Algorithms. URL: http://ocw.mit.edu/courses/engineering-systems-division/esd-77-multidisciplinary-system-design-optimization-spring-2010/lecture-notes/MITESD_77S10_lec11.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√		√		√	√	√	√
CO2	√	√	√	√	√		√		√		√	√
CO3	√	√										√
CO4	√	√	√	√	√		√		√		√	√
CO5	√	√										√

Course Code: 11CS976	**Course Title:** VIRTUALIZATION
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):

11CS503–SYSTEM SOFTWARE DESIGN ;
11CS501-R - COMPUTER NETWORKS ;
11CS504 -COMPUTER ARCHITECTURE

Course Outcomes:

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

CO1. Determine the fundamental concepts of virtualization
CO2. Outline the various methods of server virtualization
CO3. Demonstrate the concepts and issues in various Desktop virtualization
CO4. Illustrate the techniques and design of WAN virtualization and enterprise networks
CO5. Compare and analyze various components of Storage virtualization

Course Content:

UNIT I OVERVIEW OF VIRTUALIZATION 9

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization –Server and Machine Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization-Virtualization Advantages – Virtual Machine. Basics – Taxonomy of Virtual Machines - Process Virtual Machines - System Virtual Machines – Hypervisor - Key Concepts.

UNIT II SERVER VIRTUALIZATION 9

Hardware Virtualization – Virtual Hardware Overview - Server Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Server Virtualization –Uses of Virtual server Consolidation – Planning for Development – Selecting server Virtualization Platform – Case Study

UNITIII DESKTOP VIRTUALIZATION 9

Concepts - Desktop Management Issues - Potential Desktop Virtualization Scenarios – Desktop Virtualization Infrastructures - Terminal services – Hosted Desktop - Case Study

UNIT IV NETWORK VIRTUALIZATION 9

Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design – WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization.

UNIT V STORAGE VIRTUALIZATION 9

SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture.

TEXT BOOK:

1. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", A Press 2005.
2. Kumar Reddy, Victor Moreno, "Network Virtualization", Cisco Press, July, 2006.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

REFERENCES:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. Danielle Ruest, Nelson Ruest -"Virtualization: A Beginner's Guide", TMH, 2009.
3. Kenneth Hess , Amy Newman: "Practical Virtualization Solutions: Virtualization from the Trenches", Prentice Hall 2010.

WEB REFERENCES:

- TEXT BOOK: Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", A Press 2005 URL:https://books.google.co.in/books?id=qXw9p1nzb9QC&printsec=frontcover&dq=Virtualization:+From+the+Desktop+to+the+Enterprise+A+Press+2005+pdf&hl=en&sa=X&ved=0CCsQ6AEwAGoVChMIh5qg9a6WxgIVAUC8Ch24SgAK#v=onepage&q&f=false
- Intro to Virtualization URL:http://vmwarevideos.com/free-vmware-training/free-intro-virtualization-video-training-course
- Virtualization Essentials URL: http://www.lynda.com/Fusion-tutorials/Virtualization-Essential-Training/163066-2.html

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									√
CO2	√	√	√	√	√	√						√
CO3	√	√	√	√	√							√
CO4	√	√	√		√							√
CO5	√	√	√		√	√						√

Course Code:11CS977	**Course Title:** SOCIAL NETWORK ANALYSIS
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s): 11CS506 DATA WAREHOUSING AND DATA MINING

Course Outcomes:

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

CO1. Formulate and examine the fundamentals of social networks and working with datasets
CO2. Explore various classification methods and know about evolution of social networks
CO3. Be expertise in various modeling techniques and privacy preservation methods.
CO4. Visualize the data, text and tag features of social networks.
CO5. Mine various real time social and web applications.

Course Content:

UNIT I FOUNDATIONS OF SOCIAL NETWORKS 9

Introduction – Static and Dynamic properties – Random walks in Social networks – Algorithms – Applications – Evaluation and datasets. Community discovery – Applications and Methods

UNIT II CLASSIFICATION APPROACHES AND EVOLUTION 9

Local classifiers – Random walk based methods – other approaches and variations – Evolution in social networks – Framework – Challenges – Community tracing. Survey models and algorithms – Social Influence Analysis.

UNIT III MODELING AND PRIVACY PRESERVATION 9

Expert Location in social networks – approaches – location systems. Link prediction – Bayesian probabilistic models – probabilistic relational models – Linear algebraic methods. Privacy in social networks – privacy breaches and preservation mechanisms

UNIT IV MINING AND VISUALIZATION 9

Visualizing social networks – data mining and text mining in social networks – Social tagging – Tag generation models – System design and analysis – tag visualization, recommendations and applications – Tagging problems

UNIT V MINING SOCIAL WEB 9

Mining Twitter – Exploring Twitter API – Analyzing and examining tweets. Mining Facebook – Exploring social graph API – Analyzing graph connections. Mining Google+ - Computing Document similarity – Querying Human Language data with TF-IDF.

TEXT BOOKS:

1. Charu. C.Aggarwal, "Social Network Data Analytics", Springer, 2011
2. Matthew A. Russell, "Mining the Social Web", 2nd Edition, O'Reilly Media Inc., 2013

REFERENCES:

1. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st Edition, 2007
2. BorkoFurht, " Handbook of Social Network Technologies and Applications Springer", 1st Edition, 2010
3. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.

WEB REFERENCES:

- Social network analysis URL http://ocw.mit.edu/courses/sloan-school-of-management/15-599 workshop-in-it-collaborative-innovation-networks-fall-2011/lecture-notes/
- Introduction to social network methods URL: http://faculty.ucr.edu/~hanneman/nettext/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√	√	√		√	√		√
CO2		√	√	√	√	√	√	√			√	√
CO3		√	√	√	√			√				√
CO4	√	√	√	√	√			√	√	√	√	√
CO5	√	√	√	√	√	√	√	√	√	√	√	√

Course Code: 11CS979	**Course Title:** AGILE OFTWARE DEVELOPMENT
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS406 – PRINCIPLES OF SOFTWARE ENGINEERING.

Course Outcomes:

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

CO1. Describe the various concepts and activities involved in the Agile Software Development process
CO2. Define SCRUM and illustrate the benefits of using SCRUM.
CO3. Identify various individual roles and explain their responsibilities/activities in SCRUM.
CO4. Explain and analyze the SCRUM Team Structures along with their responsibilities and performances for effective project management.
CO5. Present the SCRUM requirements and specifications effectively.

Course Content:

UNIT I INTRODUCTION 9

Agile Development – Agility – Cost of Change – Agile Process – Principles and Human Factors – Extreme Programming (XP): Values, XP Process, and Industrial XP – Agile Process Models: Adaptive Software Development (ASD) – Scrum – DSDM – Crystal – Feature Driven Development – LSD – Agile Modeling – Agile Unified Process.

UNIT II SCRUM 9

Advantages of Agile Development: Higher Productivity, Lower Costs, Faster Time to Market, Higher Quality – Introduction to SCRUM – Adapting to SCRUM – Awareness – Desire – Ability – Promotion – Transfer – Integrating all Together.

UNIT III SCRUM PRACTICES AND INDIVIDUALS 10

Individual Roles – Scrum Master – Product Owner – Changed Roles: Analysts, Project Managers, Architects, Functional Managers, Programmers, DB Administrators, Testers, User Experience Designers - Technical Practices – Strive for Excellence - Test-driven development – Refactoring – Collective Ownership – Continuous Integration – Pair Programming –Design: Intentional yet Emergent – Guiding the Design.

UNIT IV SCRUM TEAMWORK 8

Team Structures – Small Team Productivity – Feature Teams – Component Teams – Guidelines for Good Team Structure – Team Responsibility – Foster Team Learning – Self-Organizing Team – Influencing Evolution: Selecting Environment, Defining Performance, Manage Meaning, Energizing the System.

UNIT V SCRUM SPECIFICATION 9

Product Backlog – Documents to Discussions – Written Documentation Disadvantages – User Stories -Progressively Refine Requirements – Emergent Requirements – Backlog Iceberg – Refining User Stories – Specify by Example.

TEXTBOOKS:

1. Roger S.Pressman, "Software engineering- A practitioner's Approach", McGraw-Hill International Edition, 7th edition, 2010.
2. Mike Cohn, "Succeeding with Agile: Software Development Using Scrum", Addison-Wesley.

REFERENCE:

1. Ken Schwaber, "Agile Project Management with Scrum (Microsoft Professional)", Microsoft Press, 2004.

WEB REFERENCES:

- Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition.URL: http://highered.mcgraw-hill.com/sites/0073375977/information_center_view0/. Mike Cohn, Succeeding with Agile: Software Development Using Scrum. URL: http://www.succeedingwithagile.com/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										√	√	
CO2										√	√	
CO3										√	√	
CO4										√	√	
CO5										√	√	

Course Code: 11CS981	**Course Title:** DISTRIBUTED SYSTEMS DESIGN
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS306–OPERATING SYSTEMS

Course Outcomes:

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

CO1. Demonstrate the architecture and identify the desirable features of Distributed systems.
CO2. Design the communication mechanisms between processes and objects in a distributed environment.
CO3. Analyze the issues related to distribute shared memory and Synchronization mechanisms.
CO4. Identify the different approaches and issues in Distributed Resource and Process management.
CO5. Apply the file accessing and replication mechanism in Distributed File systems and outline the Naming services.

Course Content:

UNIT I INTRODUCTION 9

Evolution- system models- Issues in the design of distributed systems- Distributed computing environment. Message Passing: Features- Issues in IPC- Synchronization – Buffering- Multi datagram messages – Process addressing- Failure handling

UNIT II REMOTE PROCEDURE CALLS 9

RPC Model – Implementation - Stub generation - RPC messages – Marshaling - server Management - Call semantics - communication protocols for RPC-Client server binding –Exception handling – security- special types – RPC in heterogeneous environments – Lightweight RPC - Optimizations

UNIT III DISTRIBUTED SHARED MEMORY & SYNCHRONIZATION 9

Architecture – Design and Implementation Issues – Consistency models – Clock Synchronization - Event Ordering - Mutual Exclusion – Deadlock - Election algorithms.

UNIT IV RESOURCE AND PROCESS MANAGEMENT 9

Features - Task assignment approach - Load balancing approach - Load sharing approach - Process migration Features – Mechanism -Threads: models, issues, implementation.

UNIT V DISTRIBUTED FILE SYSTEMS 9

Introduction – Features - File Models – File accessing, sharing and caching - File Replication – Fault Tolerance - Atomic transactions **NAME SERVICES**: Features – Name services and DNS

TEXT BOOK:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, New Delhi, 2005(reprint).

REFERENCES:

1. George Colouris, Jean Dollimore and Tim Kindberg, "Distributed Systems – Concepts and Design", Pearson Education Private Limited, New Delhi, 4th Edition 2009.
2. MukeshSinghal, NiranjanG.Shivaratri, "Advanced Concepts in Operating Systems: Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2000.
3. Gerard Tel, "Introduction to Distributed algorithms", Cambridge University Press, USA, 2000.

WEB REFERENCES:

- Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design",2005 URL:https://books.google.co.in/books?id=SewHKWac2I4C&pg=PA167&source=gbs_toc_r&cad=3#v=onepage&q&f=false
- NPTEL : Computer Science and Engineering -Distributed Computing Systems URL:http://www.nptel.ac.in/courses/106106107/http://www.nptel.ac.in/downloads/106106107/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√									
CO2	√	√	√	√	√							√
CO3	√				√							√
CO4	√	√	√	√								√
CO5	√	√	√	√								√

Course Code:11CS982	**Course Title:** MOBILE AND PERVASIVE COMPUTING
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS501-R COMPUTER NETWORKS

Course Outcomes:

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

CO1. Confer the Architecture in wireless and mobile networks

CO2. Comprehend and setup a wireless local area network

CO3. Expound and implement the protocols in network and transport layer of wireless network

CO4. Discuss about the computational requirements, security and performance of pervasive computing

CO5. Design a mobile device by following the appropriate technologies and explain how data communication is done

Course Content:

UNIT I WIRELESS AND CELLULAR NETWORKS 9

Cellular Wireless Networks – GSM – Architecture – Protocols – Localization and calling – Handover – Security –GPRS – DECT and UMTS.

UNIT II WIRELESS LAN 9

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – MAC Management –HiperLAN – Blue Tooth- Wi-Fi – WiMAX

UNIT III HIGHER LAYERS 9

Mobile IP – DHCP – Ad Hoc Networks. Mobile TCP– WAP – Architecture – WDP – WTLS – WTP – WSP – WAE – WTA Architecture – WML – WML Scripts.

UNIT IV PERVASIVE ARCHITECTURE 9

Context- Aware Computing – Mobile Middleware – Mobile Agents – Middleware for application development – Service Discovery

UNIT V ADHOC AND SENSOR NETWORKS 9

Adhoc networks – Features of Sensor Networks – Applications. Challenges – Resources – Security – Mobility – Protocols.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", PHI, 2nd Edition, 2009
2. F. Adelstein, S.K.S. Gupta, "Fundamentals of Mobile and Pervasive Computing". The McGraw-Hill, 2005.

REFERENCES:

1. Burkhardt, Henn, Hepper, Rintdorff, Schaeck. "Pervasive Computing", Addison Wesley, 2002.
2. Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtorff, Thomas Schack, "Pervasive Computing: Technology and Architecture of Mobile Internet Applications", Addison-Wesley, ISBN: 0201722151, 2002
3. Uwe Hansmann, L. Merk, M. Nicklous, T. Stober, U. Hansmann, "Pervasive Computing (Springer Professional Computing) ", Springer Verlag, ISBN:3540002189, 2003

WEB REFERENCES:

- http://www.cse.wustl.edu/~jain/cse574-10/
- http://www.wikihow.com/Create-a-Wireless-Network
- http://web.cse.ohio-state.edu/~prasun/publications/theses/phdthesis.pdf
- https://books.google.co.in/books?isbn=3540398813

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									√
CO2	√	√	√									√
CO3	√	√	√									√
CO4	√	√	√									√
CO5	√	√	√	√	√	√	√	√	√	√	√	√

Course Code:11CS983	**Course Title:** INFORMATION RETRIEVAL TECHNIQUES
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS303 DATA STRUCTURES
11CS505 WEB TECHNOLOGIES

Course Outcomes:
At the end of the course the student should be able to:
CO1. Design User Interfaces for Search
CO2. Comprehend about Information Retrieval Modeling and evaluation methods
CO3. Develop procedures for web indexing and searching
CO4. Understand the working of search engines and develop web crawlers
CO5. Deduce the working of Structured text retrieval systems

Course Content:

UNIT I INTRODUCTION **9**
Information Retrieval System – User Interfaces for search: Search Interfaces –Visualization – Design and Evaluation – Trends

UNIT II MODELING AND EVALUATION **9**
Modeling: Classic Information Retrieval – Other Models. Retrieval Evaluation: Retrieval Metrics – Reference Collections – User based Evaluation

UNIT III INDEXING AND SEARCHING **9**
Query Languages – Query Properties – Indexing and Searching: Inverted Indexes – Signature Files – Suffix Trees and Suffix Arrays –Multi-dimensional Indexing

UNIT IV WEB RETRIEVAL **9**
Web Retrieval: Search Engine Architectures – Search Engine Ranking – Managing Web Data – Browsing – Web Crawling: Applications – Taxonomy – Architecture and Implementation

UNIT V STRUCTURED TEXT RETRIEVAL **9**
Structured Text Retrieval: Early Text Retrieval Models – XML Retrieval and Evaluation – Query Languages. Case Study: Open Source IR

TEXT BOOK:
1. Ricardo Baeza-Yates, BerthierRibeiro-Neto, "Modern Information Retrieval", Pearson Education, 2nd Edition 2011.

REFERENCES:
1. William B.Frakes, Ricardo Baeza-Yates, BerthierRibeiro-Neto, "Information Retrieval Data Structures and Algorithms", Pearson Education, 2009.
2. Christopher D. Manning and PrabhakarRaghavan, "Introduction to Information Retrieval", Cambridge University Press, 2008.

WEB REFERENCES:
- Modern Information Retrieval URL: http://www.mir2ed.org/
- Suffix Trees and Suffix Arrays URL:http://www.inf.fu-erlin.de/lehre/WS05/aldabi/downloads/stringMatching_part2.pdf
- XML Retrieval and Evaluation URL:http://nlp.stanford.edu/IRbook/html/htmledition/xml-retrieval-1.html
- Retrieval Evaluation URL: http://www.ccs.neu.edu/home/jaa/CSG339.06F/Lectures/evaluation.pdf.

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√		√		√		√	√	√	√
CO2	√	√			√		√					√
CO3	√	√	√	√	√		√		√		√	√
CO4	√	√	√	√	√		√		√		√	√
CO5	√	√			√							√

Course Code: 11CS984	**Course Title:** GRAPH THEORY
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS303 DATA STRUCTURES and
11CS403 DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS

Course Outcomes:

At the end of the course the student should be able to:
CO1. Explain the basic concepts of Graph Theory.
CO2. Identify Fundamental Theorems on Euler graphs.
CO3. Analyze the algorithms on connectedness.
CO4. Comprehend the concepts of tree.
CO5. Study of matrix application in Graph Theory

Course Content:

UNIT I GRAPHS AND SUBGRAPHS 9

Graph – finite & infinite graphs – incidence, degree isolated and pendent Vertices –Isomorphism –sub graphs – walks- Paths and circuits.

UNIT II CONNECTEDNESS AND EULER GRAPHS 10

Connected, disconnected graphs – components – Euler graphs -Operations on Graphs –More on Euler graphs – Hamiltonian paths and circuits- Planar Graphs- chromatic Number

UNIT III ALGORITHMS IN GRAPH THEORY 8

Directed graphs - Undirected graphs- Paths –Reachability- Connectedness- Matrix representation.

UNIT IV TREES AND TYPES 9

Trees – Properties– Pendent vertices in a tree – Distances , centers in a tree –Rooted , Binary trees – Spanning trees –Spanning trees in a weighted graph.

UNIT V MATRICES AND GRAPHS 9

Cut set matrix –adjacency matrix – Chromatic partitioning – Chromatic Polynomial. Graph Theories: theorems, and applications.

TEXTBOOK:

1. Narsingh Deo, "Graph Theory with applications to Engineering & Computer Science", Prentice Hall of India, New Delhi, 2006.

REFERENCES:

1. Dr. S. Arumugam& Dr. S. Ramachandran, "Invitation to Graph Theory", Scitech Publications India Pvt Limited, Chennai, 2001.
2. K.R. Parthasarathy, "Basic Graph Theory", Tata McGraw Hill Publishing Company, New Delhi, 1994.
3. G.T. John Clark, Derek Allan Holten," A First Look at Graph Theory", World Scientific.

WEB REFERENCES:

- Graph Theory. URL: http://nptel.ac.in/courses/106108054/
- Cut set matrix. URL:http://www.academia.edu/4418417/EE-304_Electrical_Network_Theory_Class_Notes4_-_2013

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√									
CO2	√	√	√	√					√			√
CO3	√	√	√	√					√			√
CO4	√	√	√	√								
CO5	√	√	√									

Course Code:11CS985	**Course Title:** CYBER SECURITY AND CYBER LAWS
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS964 NETWORK SECURITY

Course Outcomes

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

CO1. Infer the basics of Information Security
CO2. Identify the legal, ethical and professional issues in Information Security and the aspects of risk management
CO3. Outline technological aspects of Information Security
CO4. Comprehend various cyber offences and security challenges
CO5. Discuss various cyber laws and observe various cyber-crime investigation methods.

Course Content

UNIT I INTRODUCTION 9

Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Information Security and Access, the SDLC, the Security SDLC. Need for Security: Business Needs, Threats, Attacks, Secure Software development.

UNIT II SECURITY INVESTIGATION AND SECURITY ANALYSIS 9

Risk Management: Identifying and Assessing Risk, Controlling Risk, Selecting a Risk Control Strategy. Planning for Security: Information security Policy, Standards and Practices, Information Security Blueprint

UNIT III PHYSICAL DESIGN 9

Security Technology: VPNs, Scanning and Analysis Tools, Access Control Devices, Physical Security, Security and Personnel: Positioning and Staffing the Security Function, Credentials of Information Security Professionals, Privacy and the Security of Personnel Data.

UNITIV CYBER CRIME ISSUES 9

Cyber Crime and Information Security: Classification, Legal, Cyber offences: Social Engineering, Cyber talking, Cyber cafe, Botnets, Attack Vector, Cloud Computing, Tools & methods: Attacks on Wireless Networks, Mobile &wireless Devices: Mobility, Credit card frauds, Security challenges, Attacks on Mobile Cell phones.

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UNIT V CYBER LAW 9

Cyber Crime and Cyber Security Legal perspectives: Need for law, Indian IT Act, Challenges, Digital Signatures, Amendments, Punishments, Cyber Law, Technology and Students

TEXT BOOK:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 4th Edition ,Reprint 2011.
2. SunitBelapure Nina Godbole,"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" ,Wiley India Pvt Ltd,2011.

REFERENCES:

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.
3. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi,2009.

WEB REFERENCE

- http://www.cyberlawsindia.net/

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√					√	√					√
CO2	√	√	√	√		√	√	√				√
CO3	√					√	√					√
CO4	√					√	√					√
CO5	√					√	√			√		√

Course Code: 11CS986	**Course Title:** BUSINESS INTELLIGENCE
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS506 - DATA WAREHOUSING AND MINING

Course Outcomes:

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

CO1. Understand the components of BI framework.
CO2. Describe the components of Decision Support System and its characteristics.
CO3. Describe the architecture of BPM technologies and its applications.
CO4. Analyze the characteristics, technologies, roles and approaches of Knowledge management activities
CO5. Practice the new technologies and tools in Business Intelligence.

Course Content:

UNIT I INTRODUCTION **9**

Business view of information technology applications –Getting started with BI-Introduction to business analytics - BI component framework-BI users

UNIT II DECISION SUPPORT SYSTEM (DSS) DEVELOPMENT **9**

DSS configuration, description, characteristics, capabilities, Components, user, Hardware and classifications – Data management subsystems – Model management subsystems – The user interface (DIALOG) subsystem

UNIT III BUSINESS PERFORMANCE MANAGEMENT (BPM) **9**

BPM Overview, Closed Loop Processes - Performance Measurement- BPM Methodologies, architecture and applications- Performance dashboards- Business Activity Monitoring (BAM)

UNIT IV KNOWLEDGE MANAGEMENT (KM) **9**

Introduction – Organizational learning & transformation–KM activities, approaches– Information technology and Roles of people in KM– Knowledge management systems implementation – Ensuring the success of knowledge management Efforts

UNIT V NEW TECHNLOGY IN BI **9**

BI Applications - Best practices in BI/DW-The complete BI professional, tools –Data Profiling – Balanced scorecard- Dashboards-BI road ahead

TEXTBOOKS:

1. R N Prasad, Seema Acharya, "Fundamentals of Business Analytics", 1st edition, Wiley India, 2011 (Unit 1 & 5)
2. Efraim Turban, Jay E.Aronson, Teng-Peng Liang, Ramesh sharda, "Decision Support and Business Intelligence Systems", 8/E, Pearson education, 2009 (Unit2,3 & 4)

REFERENCES:

1. Daniel J.Power,"Decision Support Systems – Concepts and Resources for Managers", 2002.
2. MarkWhitehorn& Mary Whitehorn "Business Intelligence: The IBM Solution –Data warehousing and OLAP", Springer – verlag London limited, 1999.
3. ViekiL.Sauter, "Decision Support Systems for Business Intelligence", 2nd Edition, Wiley India.

WEB REFERENCES:

- Business Intelligence: http://www-03.ibm.com/software/products/en/category/business-intelligence
- Pentaho:Data Integration | Pentaho Business Analytics Platform.
  URL: http://www.pentaho.com/product/data-integration

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√		√					√		√
CO2	√	√	√					√	√	√	√	√
CO3	√	√		√			√	√	√	√		√
CO4	√	√				√	√	√		√	√	√
CO5	√	√			√		√					√

Course Code: 11CS987	**Course Title:** INFORMATION VISUALIZATION
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Prerequisites: The student should have undergone the course(s):
11CS703–Graphics and Visualization

Course Outcomes:

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

CO1: Investigate on the basic elements necessary for graphics and data visualization
CO2: Explore the various stages in visualizing the data
CO3: Analyze various methodologies and standards used for color management
CO4: Characterize various techniques for identifying static and moving patterns
CO5: Illustrate object recognition phenomenon through diagrams, gestures and animated languages.

Course Content:

UNIT I DATA VISUALIZATION 9

Data Visualization- Info graphics Vs Data Visualization – Informative Vs Visual Art – Ingredients of successful Visualization- Visual Encoding – Layout and Axes- Color- Size-Shape –Lines

UNIT II VISUALIZATION STAGES 9

Stages of visualizing the Data –sketching and scripting –mapping –time series-Axis labels connections and correlations-sophisticated sorting-deployment issues in scatter plot maps

UNIT III COLOR 9

Trichromacy Theory-Color Blindness-Color Measurement-CIE System of Color Standards Opponent Process Theory-Color Appearance-Applications of Color in Visualization

UNIT IV STATIC AND MOVING PATTERNS 9

Gestalt Laws-Contours-Perception of Transparency: Overlapping Data-Perceptual Syntax of Diagrams-Patterns in Motion-Data Selection and Manipulation Loop-Exploration and Navigation

UNIT V VISUAL& DATA OBJECTS AND GESTURES 9

Image and structure based object recognition – Object based diagrams – Surface shapes of objects – Coding Words and Images – visual and spoken Languages – Animated Visual languages

TEXT BOOKS:

1. Noah Iliinsky, Julie Steele, "Designing Data Visualizations: Representing Informational Relationships", O'Reilly Media, Inc.", 2011.
2. Ben Fry, "Visualizing Data: Exploring and Explaining Data with the Processing Environment", Kindle Edition ,2007.
3. Colin Ware, "Information Visualization: Perception For Design" , 2nd Edition, 2004.

REFERENCE:

1. Andy Kirk, "Data Visualization: A Successful Design Process", 1st Edition, 2012.

WEB REFERENCES:

- http://www.infovis-wiki.net/index.php?title=Visualization_Design_Patterns
- http://documents.software.dell.com/Statistics/Textbook/Graphical-Analytic-Techniques

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√		√	√	√					√	√	√
CO2	√	√	√	√	√				√	√	√	√
CO3	√		√	√	√	√		√	√	√	√	√
CO4		√	√	√	√	√			√	√	√	
CO5	√		√	√	√	√	√		√	√	√	√

Course Code: 11CS988-R	**Course Title:** CLOUD TECHNOLOGY
Core/Elective: Elective	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Course Outcomes:

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

CO1. Identify and explain the components in cloud architecture and its services.
CO2. Discuss cloud deployment models and their characteristics from different providers.
CO3. Communicate and collaborate using cloud services.
CO4. Illustrate and describe cloud based techniques for implementation.
CO5. Use various methods and tools to collaborate online through cloud services.

Course Content:

UNIT I FOUNDATIONS OF CLOUD COMPUTING 8

Introduction - Cloud Computing – Cloud Architecture – Cloud Storage –Computing in Cloud: Pros and Cons, Cloud and Virtualization, Dynamic Infrastructure, Services Requirements, Computing Characteristics.

UNIT II CLOUD DEPLOYMENT AND OFFERINGS 9

Cloud Characteristics – Measured Service – Cloud Deployment Models – Security in a Public Cloud – Cloud Analytics – Testing under Cloud – Information Security – Virtual Desktop Architecture – Storage Cloud – Amazon Ec2 – Google App Engine – MS Azure.

UNIT III CLOUD SERVICES AND MANAGEMENT 9

Cloud Services: SaaS, IaaS, PaaS – Cloud Ecosystem and Business Process Management – Cloud Service Management – Computing on Demand (CoD) – Service-based Model – Resiliency – Provisioning – Asset Management – HA and Disaster Recovery.

UNIT IV CLOUD IMPLEMENTATION TECHNOLOGIES 10

Cloud Virtualization Technology – Benefits – Server Virtualization – Virtualization for x86 – Infrastructure Requirements – Storage Virtualization and Storage Area Networks – Network-Attached Storage – Virtualization in Datacenter – Cloud and SOA – Cloud Mobility.

UNIT V ONLINE COLLABORATION TOOLS 9

Collaboration using online Scheduling Applications, Planning, and Task Management – Contact Management, CRM, and SFA – Collaborating on Project Management – Web-based Word Processors and Databases - Evaluating Web Conferencing Tools - Collaborating via Social Networks and Groupware

TEXT BOOKS:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kumar Saurabh, "Cloud Computing – Insights into New Era Infrastructure", Wiley Indian Edition, 2011.

REFERENCES:

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July 2008.
2. John Ritting house& James Ransome, "Cloud Computing, Implementation, Management and Strategy", CRC Press, 2010.

WEB REFERENCES:

- Peter Mell and Timothy Grance, The NIST Definition of Cloud Computing. URL: http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf
- Alexa Huth and James Cebula, The Basics of Cloud Computing. URL: https://www.us-cert.gov/sites/default/files/publications/CloudComputingHuthCebula.pdf, © 2011 Carnegie Mellon University. Produced for US-CERT, a government organization.
- An Overview of Cloud Computing. URL:https://www.nsa.gov/research/_files/publications/cloud_computing_overview.pdf

Mapping of Course Outcomes to Programme Outcomes:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√					√						√
CO2	√											√
CO3	√		√		√					√	√	√
CO4	√				√					√	√	√
CO5	√		√		√					√	√	√

8 COURSE ASSESSMENT AND EVALUATION

Course Assessment and Evaluation (2016-17)

Component	2011 Regulations	Internal Assessment Methodology
Theory	• End Semester Exam: 75 marks • Internal Assessment: 25 marks	• 20 marks from Best 2 of CCET I, CCET II and Retest + 10 marks from CCET III • 3 TQA* components averaged to 10 marks • Total 40 reduced to 25 marks
Practical	• End Semester Exam: 25 marks • Internal Assessment: 75 marks	• Preparation: 20 marks • Observation and Results: 25 marks • Record: 20 marks • Viva: 10 marks • Total 75 calculated by averaging all experiments
Project work	**Phase I (100)** • End Semester Exam: 25 marks • Internal Assessment: 75 marks **Phase II (200)** • End Semester Exam: 50 marks • Internal Assessment: 150 marks	• 3 Reviews in each Phase

Component	2014 / 2016 Regulations	Internal Assessment Methodology
Theory	• End Semester Exam: 60 marks • Internal Assessment: 40 marks	• 20 marks from Best 2 of CCET I, CCET II and Retest + 10 marks from CCET III • 3 TQA* components averaged to 10 marks
Practical	• End Semester Exam: 25 marks • Internal Assessment: 75 marks	• Preparation: 20 marks • Observation and Results: 25 marks • Record: 20 marks • Viva: 10 marks • Total 75 calculated by averaging all experiments

***TQA – Tutorial / Quiz / Assignment Component -**In case of Self Study subjects a Test for 25 marks will be conducted in place of 3rd TQA