COURSE NAME: VLSI DESIGN

COURSE CODE: EC-14701

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 30%-40%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Describe the fabrication process and properties of MOS devices.

CO2 Analyze the impact of scaling on MOS circuits.

CO3 Comprehend the need of hardware description language and its features.

CO4 Explain various modeling styles of architecture declaration.

CO5 Design combinational and sequential circuits using VHDL.

Syllabus:

Unit 1. Review of MOS Devices

MOS Structure, NMOS, PMOS and CMOS fabrication, Enhancement & Depletion Transistor.

Unit 2. Basic Electrical Properties and Circuit Concepts

MOS device design equations: drain current-voltage, threshold voltage, transconductance. NMOS Inverter and Transfer characteristics, pull up and pull down ratios of NMOS, alternative forms of pull up, CMOS Inverter and transfer characteristics, Latch-up in CMOS circuits.

Unit 3. Scaling of MOS Circuits

Scaling Models, Scaling factors for device parameters, Limitations of Scaling.

Unit 4. Introduction to VHDL

Introduction to VLSI design cycle, Computer-aided design tools for digital systems, Hardware description language: VHDL, features, Data objects, Classes and data types, Operators, Sub-programs, Overloading.

Unit 5. Architecture Modeling Styles

Behavioral, structural, data flow style of modeling: Assignment statements, Sequential Statements and Process, Conditional Statements, Case Statements, Loops, Resolution Functions, Packages & Libraries, Concurrent Statements.

Unit 6. Applications of VHDL

Combinational Circuit Design such as such as Multiplexers, Encoders, Decoders, Code Converters, Comparators, and Implementation of Boolean functions etc., Sequential Circuit Design such as Shift registers, Counters, Flip-flops etc.

Text Books:

1. J. Bhasker, "A VHDL Primmer", Prentice Hall PTR, 1999.

2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design", Prentice Hall India, 3rd Edition, 2003.

3. Neil H. E. Weste and K. Eshraghian, "Principle of CMOS VLSI Design: A Systems Perspective" Addison Wesley, 2000.

4. D. L. Perry, "VHDL: Programming by Example", Tata McGraw-Hill, 2002.

Reference books and other resources:

1. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL Design" McGraw-Hill Education, 2008.

2. S.- M. Kang, Y. Leblebici, "CMOS digital integrated circuits: Analysis & design", Tata McGraw-Hill, 3rd Edition, 2003.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
UNIT 1	H	-	-	-	-
UNIT 2	H	-	-	-	-
UNIT 3	-	H	-	-	-
UNIT 4	-	-	H	-	-
UNIT 5	-	-	-	H	-
UNIT 6	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	-	-	L	H	-	-	L	H	H	L	H
CO2	H	L	-	-	H	-	-	L	H	H	L	H
CO3	H	L	-	-	H	-	-	-	-	-	-	-
CO4	H	M	-	-	H	-	-	-	-	-	-	-
CO5	H	H	L	M	H	-	-	-	H	H	H	M

COURSE NAME: OPTICAL COMMUNICATION

COURSE CODE: EC-14702

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 20%-30%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Explain the fundamental concepts of optical fiber transmissions.

CO2 Describe the basic concepts of degradation, fabrication and measurement techniques employed in fibers.

CO3 Analyze the optical sources and detectors and derive the expression for their efficiency.

CO4 Explain the architecture and operation of optical amplifier and integrated optical devices.

CO5 Describe the concepts of nonlinear optical effects in optical communication system.

Syllabus:

Unit 1. Introduction

Elements of an optical fiber transmission link, introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

Unit 2. Optical Fibers

Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation in optical waveguides due to dispersion and attenuation, pulse broadening in graded-index waveguides, mode coupling, fiber fabrication: vapor-phase axial deposition, plasma-activated chemical deposition and double-crucible method. Measurement techniques: optical spectrum

analyzers, optical time domain reflectometer (OTDR).

Unit 3. Optical Sources and Detectors

Optical sources - LEDs and Lasers, Photo-detectors - pin-detectors, Avalanche photodiode, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

Unit 4. Optical Amplification and Integrated Optics

Optical amplifiers – semiconductor optical amplifier, EDFA, Raman amplifier, Integrated optical devices: directional couplers, electro-optic switches, modulator, polarization transformer, frequency translators.

Unit 5. Nonlinear Optical Effects

Nonlinear effects in fiber optic links. Concept of stimulated light scattering, self-phase modulation, four wave mixing, group velocity dispersion and solition based communication.

Text Books:

1. G. Keiser, "Optical Fiber communications", McGraw Hill Education, 3rd Edition, 2000.
2. J. M. Senior, "Optical Fiber Communications, Principles and Practices", Pearson Education, 3rd Edition, 2010.

Reference books and other resources:

1. J.E. Midwinter, "Optical Fibers for Transmission", John Wiley, 1979.
2. J. Gowar, "Optical Communication Systems", Prentice Hall India, 1987.
3. G. Agrawal, "Nonlinear Fibre Optics", Academic Press, 2nd Edition 1994.
4. G. Agrawal, "Fiber Optic Communication Systems", John Wiley and Sons, New York, 1992

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
UNIT 1	H	L	-	-	-
UNIT 2	-	H	-	-	-
UNIT 3	-	-	H	-	-
UNIT 4	-	-	-	H	-
UNIT 5	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	-	-	-	H	-	-	L	-	-	M	H
CO2	H	-	-	-	H	-	-	L	-	-	M	H
CO3	H	-	-	-	H	-	-	L	M	-	M	H
CO4	H	-	-	-	H	-	-	L	M	-	M	H
CO5	H	-	-	-	H	-	-	L	M	-	M	H

COURSE NAME: ENGINEERING MANAGEMENT

COURSE CODE: EC-14703

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 10%-20%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Develop ability to analyze and solve problems methodically as well as manage individual and team projects with appropriate consideration of engineering and financial aspects.

CO2 Apply knowledge of economics for the analysis of Engineering and Management issues.

CO3 Have an understanding of professional, ethical and social responsibilities as professional Engineer and manager.

CO4 Integrate performance management and organizational effectiveness.

CO5 Perform effectively in groups and teams as a member / leader.

Syllabus:

Unit 1 Project Management

Project and Project Management, Project life cycle, Organizational structures (functional, matrix and projectized), Importance of organizational structures.

Unit 2 Engineering Economics

Introduction to engineering economics- Importance, Time value of money, Interest and Interest Rate, Cost analysis- Breakeven analysis, Two and three alternatives, Breakeven charts, effects of

changes in fixed and variable cost, Economic life of a project, Economic analysis- Decision making in selection of alternative by Rate of Return method and Uniform Annual Cost method.

Unit 3 Leadership and Management

Introduction to Leadership and Leadership Effectiveness, Qualities of a Leader, Effects of a Leader on Management performance, Team and Team Development, Evaluation of performance of a team, Relationship between a leader and its team.

Unit 4 Ethical Management

Ethical responsibility towards organization, Effect of ethics on management, Corporate social Responsibility (CSR).

Unit 5 Human resource management

Role of Human Resources, Strategic Planning in HRM, Recruitment Process, Training and Development, Employee Assessment.

Unit 6 Motivation of employees

Need, Effects on management, Motivational Techniques, Motivational Theories (Maslow's hierarchy of needs, Herzberg's two-factor theory, Vroom's expectancy theory and Locke's goal theory).

Unit 7 Risk and Risk Management

Types of risks, Effects of risk on management, Risk management strategies, Risk reduction strategies.

Unit 8 Quality Management

Scope, Benefits of standardization, Quality Planning, Quality Assurance, Configuration Management.

Text Books:

1. K.R. Singhal and R. Singhal, "Engineering Economics and Industrial Management", Kataria and Sons, 1st Edition, 2014.
2. G. Dessler, "Human Resource Management" Pearson Publications, 13th edition, 2011
3. K. Nagarajan, "Project Management", New Age International Publishers, New Delhi, 3rd edition, 2007.

Reference books and other resources:

1. B. Patnayak, "Human Resource Management", PHI, 3rd Edition, 2010.
2. K. Schwalbe, "An Introduction to Project Management", Paperback, 5th Edition, 2015.
3. G.J. Thuesen, W.J. Fabrycky, "Engineering Economy" Prentice Hall, 2001.
4. C. E. Bullinger, "Engineering Economic Analysis" Tata McGraw Hill, 1950.
5. "Engineering Economic Analysis" Available (online) [[http://www.nptel.ac.in/courses/112107209]

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
UNIT 1	H	-	-	-	-
UNIT 2	-	H	-	-	-
UNIT 3	-	-	-	M	H
UNIT 4	-	-	H	M	H
UNIT 5	-	-	-	H	M
UNIT 6	-	-	M	H	H
UNIT 7	M	-	-	-	-
UNIT 8	M	-	-	-	-

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	H	H	H	H	H	H	-	M	-	-	L
CO2	H	M	H	-	M	-	-	H	-	M	M	L
CO3	-	-	-	M	-	H	-	L	M	-	-	-
CO4	H	-	-	M	-	L	M	-	-	-	-	-
CO5	-	-	-	H	-	H	H	-	-	-	-	-

COURSE NAME: CMOS BASED DESIGN

COURSE CODE: DEEC-14704

Internal Marks: 40 **L T P**

External Marks: 60 **3 1 -**

Numerical & Design Problems Content: 20%-30%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Explain the basics of MOS devices, DC transfer characteristics and tristate inverters.

CO2 Comprehend the layout design rules, stick diagrams and fabrication process of CMOS technology.

CO3 Understand the CMOS circuit characteristics, performance parameters, various parasitic elements and scaling process.

CO4 Designand Analyse the various logic circuit layouts for both static and dynamic CMOS circuits

Syllabus:

Unit 1 Introduction to MOS device

Introduction to IC Technology, Basic MOS Transistor (enhancement and depletion mode), NMOS process, CMOS process(P-well, N-well and twin-tub).MOS models, MOS structure capacitance, Nonideal I-V effects, Mobility degradation and velocity saturation, channel length modulation, threshold voltage effects, Leakage, temperature and geometry dependence, Resistive operation, saturation region, , body effect, DC transfer characteristics, Tristate inverters, , Hotcarrier effect, drain current Vs voltage charts, sub threshold conduction.

Unit 2 CMOS Processing

CMOS technologies, wafer formation photolithography channelformation, isolation, gate oxide, gate source, drain formation, contacts and metallization, layoutdesign rules, design rule checking. CMOS process enhancement, fabrication and manufacturing issues, CMOS layout and stick diagrams.

Unit 3 Circuit Characterization & Performance Estimation

Delay estimation , delay models, inverter design using delay constraints, sources of power dissipation, estimation of interconnect parasitic,calculation of interconnect delay, reliability, variability, transistor sizing, Scalingmodels, scaling factor for device parameters, Advantages and Limitations of scaling.

Unit 4 Design of Combinational & Sequential Circuits: Static CMOS design, complementary CMOS, staticproperties, complementary CMOS design, Power consumption in CMOS logic gates, dynamicor glitching transitions, Design to reduce switching activity, Radioed logic, DC VSL, passtransistor logic, Differential pass transistor logic, sizing of level restorer, sizing in passtransistor, Dynamic CMOS design, Domino logic, optimization of Domino logic, NPCMOS,Implement efficient techniques at circuit level for improving power and speed of combinational and sequential circuits, Designing logic for reduced supply voltages, Pitfalls and Fallacies, sequencing static circuits and circuit design of latches and flip flops.

Text Books:

1. Weste& Harris, *CMOS VLSI Design: A Circuits and Systems Perspective*, 3rd ed, Addison Wesley, 2005.

2. Nail H.E. Weste, David Harris, Ayan Banerjee, ―CMOS VLSI DESIGN‖, Pearson Education.

Reference books and other resources:

1.Jan M Rabaey, Digital Integrated Circuits, 2nd Edition, Pearson Education, 2003

2.Patterson & Hennessy, *Computer Organization & Design*, 2nd ed, Morgan Kaufmann, 1998

3.Sung-Mo Kang, CMOS Digital Integrated Circuits, 3rd Edition, McGraw-Hill, 2003.

4. Kang and Leblebici ―CMOS Digital integrated circuits‖, TMH 2003.

5.Wayne Wolf, ―Modern VLSI Design ", 2nd Edition, Prentice Hall, 1998.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
UNIT 1	H	-	-	-
UNIT 2	-	H	-	-
UNIT 3	-	-	H	-
UNIT 4	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	H	-	-	M	-	-	H	H	-	-	H
CO2	H	H	-	-	M	-	-	H	H	-	-	H
CO3	H	H	-	-	M	-	-	H	H	-	-	H
CO4	H	H	-	-	H	-	-	H	H	-	-	H
CO5	H	H	-	-	M	-	-	H	H	-	-	H

COURSE NAME: BIOMEDICAL ELECTRONICS

COURSE CODE: DEEC-14705

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Describe the methods of recording and measuring various bio potentials.

CO2 Analyze medical imaging systems.

CO3 Classify and describe therapeutic equipments.

Syllabus

Unit 1. Measuring, Recording and Monitoring Instruments

MEMS, Bioelectric signals, electrodes, biosensors, ECG, EEG, Oximeters, Biotelemetry, Clinical data Interchange Standards, Cyber Medicine, Spirometry, Pulmonary Function Analyzers, Blood cell counters.

Unit 2. Modern Imaging Systems

Basics of Diagnostic Radiology, X-ray machine, Visualization of X-rays, Physical parameters for X-ray Detectors, Principle of NMR Imaging system, Image reconstruction techniques, Basic NMR components, Biological effect of NMR imaging, Advantages of NMR imaging system.

Unit 3. Ultrasonic Systems

Basics of diagnostic radiology, Diagnostic Ultrasound, Physics of Ultrasonic waves, Medical ultrasound, Three-dimensional ultrasound imaging systems, Portable ultrasound systems

Unit 4. Therapeutic Equipment

Need for Cardiac pacemakers, Implantable pacemakers, DC Cardiac defibrillators, Surgical Diathermy, Physiotherapy equipment, Electrotherapy equipment, Capnography, Radiotherapy equipment, Laser applications in Biomedical field.

Text Book:

1. R. S. Khandpur, "Magnetic Resonance Imaging System", in Handbook of Biomedical Instrumentation, Third Edition, New Delhi, India: McGraw Hill Education, 2014.

Reference books and other resources:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical EquipmentTechnology", John Wiley and Sons, New York, 2004.
2. Leislie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall ofIndia, New Delhi, 2007.

Mapping of course contents with CO

Contents	CO1	CO2	CO3
Unit 1	H	-	-
Unit 2	-	H	-
Unit 3	-	H	-
Unit 4	-	-	H

Mapping of CO with PO

CO	PO										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	-	-	-	-	-	-	-	M	-	-
CO2	H	-	-	-	-	-	-	-	M	-	-

CO3	H	-	-	-	-	-	-	-	M	-	-

COURSE NAME: SATELLITE COMMUNICATION

COURSE CODE: DEEC-14706

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 20%-30%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Express the origin and history of Satellite Systems, state the frequency allocation for satellite services and list its applications.

CO2 Describe Kepler's laws, satellite orbital elements and the Space segment.

CO3 Discuss various propagation impairments.

CO4 Explain and analyze Satellite System Link budget.

CO5 Comprehend various Satellite Access Systems.

CO6 Explicate various Satellite applications & Specialized services.

Syllabus:

Unit-1. Introduction to Satellite Communication

Historical evolution of Satellite Communication, Frequency allocation of Satellite Services, INTELSAT, Applications, Future trends in Satellite Communication.

Unit-2. Orbital Mechanism and Space Segment

Kepler's laws of planetary motion, terms used for earth orbiting satellites, orbital elements, Geostationary orbit and non-Geostationary orbits, Angle of azimuth & Angle of elevation,

Satellite Attitude Control, Satellite Station Keeping ; Telemetry, Tracking, Command & Monitoring (TTC&M); Transponder.

Unit-3. Propagation impairments

Propagation impairments**:** Atmospheric loss, Ionospheric effects, Rain attenuation, Depolarization, Tropospheric scintillation, Cloud attenuation and other impairments.

Unit-4. Satellite Link design

Basic transmission theory, System Noise Temperature, C/N and G/T ratios, Satellite Downlink design- link budget, Uplink design, System design examples.

Unit-5. Satellite Access

Multiple access schemes**:** FDMA **:** Fixed assigned FDMA, Demand Assigned FDMA-SPADE System, TDMA **:** Frame Structure, Reference Burst structure, Traffic burst structure, Frame acquisition & synchronization, Fixed assigned TDMA, Demand assigned TDMA, Introduction to CDMA.

Unit-6. Satellite Services

INSAT, VSAT, Mobile satellite services-GPS, Satellite Navigation system, Direct Broadcast satellite(DBS)-television **,** Digital Audio Broadcast (DAB).

Text Books:

1. T. Pratt, C. Bostian & J. Allnutt, 'Satellite Communications', 2nd Ed., Wiley India, New Delhi, 2008
2. D. Roddy, 'Satellite Communications',4th Ed., Tata Mc-Graw-Hill, New Delhi, 2009.

Reference books:

1. A. K. Maini and V. Agrawal, 'Satellite Communications',1st Ed., Wiley India Pvt. Ltd., New Delhi, 2010
2. Tri T.Ha, 'Digital Satellite Communications',2nd Ed., Tata McGraw-Hill, New Delhi, 2009
3. Dr. D. C. Agarwal, ' Satellite Communications', 6th Ed., Khanna Publishers,2008

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6
UNIT 1	H	-	-	-	-	-
UNIT 2	-	H	-	-	-	-
UNIT 3	-	-	H	-	-	-
UNIT 4	-	-	-	H	-	-
UNIT 5	-	-	-	-	H	-
UNIT 6	-	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**K**	**l**
CO1	-	-	-	-	-	-	-	-	H	H	-	H
CO2	H	-	--	-	-	-	-	-	-	H	-	H
CO3	H	-	H	-	-	-	-	-	-	-	-	H
CO4	H	-	H	-	H	-	-	H	H	H	-	H
CO5	-	-	-	-	-	-	-	H	H	H	-	H
CO6	-	-	-	-	-	-	-	H	H	H	--	H

COURSE NAME: SPEECH & IMAGE PROCESSING

COURSE CODE: DEEC-14707

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On the successful completion the course, the student should be able to:

1. Describe the basics of digital image processing.
2. Implement image transforms and enhancement techniques in time and frequency domains.
3. Explore the color and multispectral aspects of three dimensional images
4. Explain the basic auditory mechanism of human speech production system
5. Use artificial intelligence techniques for processing speech.

Syllabus:

Unit 1. Digital Image Fundamentals

Origin of digital image processing, fundamental steps & components of digital image processing, Elements of visual perception, light electromagnetic spectrum, image sensing & acquistion, image sampling & quantization, Connectivity and Relations between Pixels.

Unit 2. Image transforms and enhancement

Image Transforms: 2D Orthogonal and Unitary Transforms: Properties and Examples,2D DFT,FFT, DCT, Hadamard Transform, Haar Transform, Slant Transform, KL Transform: Properties and Examples.

Image Enhancement: Histogram modeling, equalization and modification, Image smoothing, Image crispening.

Unit 3. Color and multispectral image processing

Color Image Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models. Multispectral Image Analysis , Color Image Processing Three Dimensional Image Processing, Computerized Axial Tomography, Stereometry, Stereoscopic Image Display, Shaded Surface Display.

Unit 4. Representation of speech and speech production

Models of Speech production: Human speech production mechanism, acoustic theory of speech production, digital models for speech production, Perception of Loudness, Critical bands, Pitch perception, Auditory masking.

Unit 5. Automatic speech recognition (ASR)

The Decision processes in ASR, Representative recognition performance, Principle Component Analysis, Singular Value Decomposition, Usage of Artificial Intelligence and Linear algebra in Speech processing.

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods: Digital Image Processing, Addison-Wesley, 1992
2. T.F. Quatieri: Discrete-time Speech Signal Processing, Prentice-Hall, PTR, 2001.

Reference books:

1. Anil K. Jain: Fundamentals of Digital Image Processing, Prentice Hall, 1989.
2. William K. Pratt: Digital Image Processing, 4th Edition, John Wiley & Sons Inc., 2007.
3. Kenneth R. Castleman: Digital Image Processing, Prentice Hall, 1996.
4. Lawrence R. Rabiner and Ronald. W. Schafer: Introduction to Digital speechprocessing, now publishers USA, 2007.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
UNIT 1	H	-	-	-	-
UNIT 2	-	H	-	-	-

UNIT 3	-	-	H		-
UNIT 4	-	-	-	H	-
UNIT 5	-	-	-	-	H

Mapping of CO with PO

CO	**PO**											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	-	-	-	-	-	-	-	-	-	-	-
CO2	H	-	H	-	H	-	-	-	-	H	-	H
CO3	H	-	-	-	H	-	-	-	H	H	-	H
CO4	-	-	-	-	-	-	-	-	H	-	-	-
CO5	H	-	-	-	H	-	-	-	H	H	H	H

COURSE NAME: HUMAN RESOURCE MANAGEMENT

COURSE CODE: DEEC-14708

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course outcomes:

On completion of syllabus students will be able to:

CO1 Interpret planned key to human resource function within organization.

CO2 Recognize current issues, trends, processes and practices in HRM.

CO3 Integrate employee's performance management and organizational effectiveness.

CO4 Extend employability skills for all workplaces.

CO5 Utilize effective oral and written communication skills.

Syllabus:

Unit 1. Introduction to Human Resource

Definition, Role and Functions of Human Resource Management, Concept and Significance of HR, Role of HR managers, HR functions and Global Environment.

Unit 2. Human Resources Planning

Need and Process for Human Resource Planning, Methods of Recruitment, The Process of Human Resource Planning, Difficulties in human resource planning, Recruitment and selection processes, Sources of Recruitment, Restructuring strategies, Placement and Induction, Retention of Employees, , Employment Exchanges.

Unit 3. Training and Development

Principles of Training, Employee Development, Need for skill up gradation, Assessment of training needs, Retraining and Redeployment methods and techniques of training employees and executives, performance and potential appraisal systems, 360 degree appraisal and feedback, Career Development & Planning.

Unit 4. Job analysis, Design and Satisfaction

Job Analysis & Job Description, Job Specification, Job Specification versus Job Description, Job satisfaction, Motivation, Factors affecting motivation, Theories of Motivation, Quality of work life.

Unit 5. Industrial Relations

Factors influencing industrial relations, State Interventions and Legal Framework, Role of Trade unions, Structure of Trade Unions, Collective Bargaining, Worker's participation in management.

Text Books:

1. Gary Dessler, Human Resource Management (8th ed.), Pearson Education, Delhi
2. A Minappa and M. S. Saiyada - Personnel Management (Tata Mc. Graw-Hill)

Reference Books/ Resources:

1. T.N.Chhabra- Human Resource Management (Dhanpat Rai & Co.).
2. Biswajeet Patanayak, Human Resource Management, PHI, New Delhi
3. NPTEL Course on Human Resource Management-I, Available at: http://nptel.ac.in/courses/122105020/

Mapping of course contents with CO:

Contents	CO1	CO2	CO3	CO4	CO5
Unit1	H	H	-	-	M
Unit2	H	H	M	L	M
Unit3	M	H	-	-	H

Unit4	L	-	H	H	H
Unit5	M	H	L	M	-

Mapping of CO with PO:

CO	**PO**											
	a	b	c	d	e	f	g	h	i	j	k	l
CO1	-	-	M	M	-	-	-	-	-	-	-	-
CO2	-	-	L	-	-	M	-	-	-	-	-	-
CO3	-	-	-	M	-	-	-	-	-	-	-	-
CO4	-	-	-	M	-	-	-	-	-	-	-	-
CO5	-	-	-		-	-	M	-	-	-	-	M

-

COURSE NAME: COMPUTER ORGANIZATION AND ARCHITECTURE

COURSE CODE: DEEC-14709

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 20%-30%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Comprehend the architecture and organization of computers

CO2 Describe the memory organizations in a computer system

CO3 Explain the concept of sequencing and memory management in an operating system.

CO4 Discuss the hardware and software performance issues in a multi-core organization.

Syllabus:

Unit 1. Introduction

Organization and Architecture, Structure and Function, Brief history of Computers, Designing for performance, Performance metrics: MIPS, MFLOPS, Computer Components and Functions, Interconnection Structures, Bus Interconnection, Point-to-Point Interconnect, PCI Express, Flynn's classification of Computers (SISD, MISD, MIMD), Error Detection and Correction.

Unit 2. Internal and Cache Memory

Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design, Pentium 4 Cache Organization, Semiconductor Main Memory, Advanced Drum Organization

Unit 3. Basic non Pipeline CPU Architecture and Operating System

CPU Architecture, types(accumulator, register, stack, memory/register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3-5 stage), microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining, Operating system overview, Scheduling, Memory Management, Pentium Memory Management, RISC v/s CISC.

Unit 4. Parallel Processing and Multi-Core computer

Multiple Processor Organizations, Symmetric Multiprocessors, Cache Coherence and the MESI protocol, Multithreading and Chip Multiprocessors, Clusters, Non-Uniform Memory Access, Vector Computation, Multi-Core Computers, Hardware and Software Performance Issues, Multi-Core Organization, Intelx86 Multi-Core Organization

Text Books:

1. William Stallings, Computer Organization and Architecture, 9/E Pearson, Delhi.

Reference Books:

1. Computer Architecture and Organization, 3rd Edition, John P. Hayes, 1998, TMH.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
UNIT 1	H	H	-	-
UNIT 2	-	H	M	L
UNIT 3	M	H	-	-
UNIT 4	L	-	H	-

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**K**	**l**
CO1	M	-	-	-	M	-	-	-	-	-	-	-
CO2	M	-	-	-	L	-	-	-	-	-	-	-
CO3	M	-	-	-	L	-	-	-	-	-	M	-
CO4	M	-	-	-	L	M	-	-	-	-	M	-

COURSE NAME: CAD FOR VLSI DESIGN

COURSE CODE: DEEC-14710

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 5%-10%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Understand the VLSI design methodologies, various design automation tools and basics of data structures & algorithms.

CO2 Comprehend the layout design rules, fabrication process, Constraint-graph compaction and different algorithms of Partitioning and Placement.

CO3 Explain the concepts of floor planning and various routing algorithms.

CO4 Describe the fundamental concepts of verilog language & various modeling and simulations.

CO5 Analyze the various synthesis and scheduling algorithm in CAD VLSI.

Syllabus:

Unit 1. Introduction

Introduction to design methodologies, VLSI Design Cycle, Design styles: full-custom, standard-cell, gate-array and FPGA. Review of Data structures and algorithms, Review of VLSI Design automation tools, Algorithmic Graph Theory and Computational Complexity, Tractable and Intractable problems, general purpose methods for combinatorial optimization.

Unit 2. Design Rules, Partitioning & Placement

Review of MOS/CMOS Fabrication Technology, Layout Compaction, Design rules, problem formulation, algorithms for constraint graph compaction, placement and partitioning: Circuit representation and problem formulation, Placement algorithms, Partitioning algorithms; Kernighan Lin (K-L) and Fiduccia Mattheyses (FM).

Unit 3. Floor Planning & Routing

Floor planning concepts, shape functions and floor plan sizing, Types of local routing problems , Area routing, channel routing, global routing, overview of clock and power routing, algorithms for global routing.

Unit 4. Simulation

Simulation, Gate-level modeling and simulation, Switch-level modeling and simulation, an overview of Verilog language.

Unit 5. Modelling and Synthesis

Logic synthesis and verification, High level Synthesis, Hardware models, internal representation, Allocation, assignment and scheduling, Simple scheduling algorithm, Assignment problem, High level transformations.

Text Books:

1. S.H. Gerez, “Algorithms for VLSI Design Automation”, John Wiley & Sons, 2002.
2. N.A. Sherwani, “Algorithms for VLSI Physical Design Automation”, Third Edition, Springer, 2013.
3. J. Bhasker, “Verilog VHDL synthesis: a practical primer”, Star Galaxy publishing 1998.

Reference books and other resources:

1. Drechsler, Rolf, “Evolutionary Algorithms for VLSI CAD” Springer Science & Business Media, 1998.
2. Trimberger, Stephen M., “An Introduction to CAD for VLSI”, Springer Science & Business Media, 1987.

3. Sadiq M. Sait and H. Youssef, “VLSI Physical Design Automation: Theory and Practice”, World Scientific, 1999
4. Cormen, Thomas H., Charles E. Leiserson, and Ronald L. Rivest. "Introduction to Algorithms." The MIT Press, 3rd edition, 2009.
5. Steven M.Rubin, “Computer Aids for VLSI Design”, Addison Wesley Publishing 1987.
6. D.D. Gajski, N.D. Dutt, A.C. Wu and A.Y. Yin, “High-level synthesis: introduction to chip and system design”, Kluwer Academic Publishers, 1992.
7. M. Sarrafzadeh and C.K. Wong, “An introduction to physical design”, McGraw Hill, 1996.
8. M. Sarrafzadeh and C.K. Wong, Introduction to VLSI Physical Design, Fourth Edition, McGraw-Hill., 1996.
9. Charles J. Alpert, Dinesh P. Mehta, Sachin S. Sapatnekar, Handbook of Algorithms for Physical Design Automation, Auerbach Publications (CRC Press), 2008.
10. S.K. Lim, Practical Problems in VLSI Physical Design Automation, Springer, 2008
11. Palnitkar, Samir, “Verilog HDL”, Prentice Hall PTR, 2nd edition, 2003

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
UNIT 1	H	-	-	-	-
UNIT 2	-	H	-	-	-
UNIT 3	-	-	H	-	-
UNIT 4	-	-	-	H	-
UNIT 5	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	L	-	-	H	-	-	-	H	-	-	H
CO2	H	M	-	-	H	-	-	-	H	-	-	H

CO3	H	H	-	-	H	-	-	-	H	-	-	M
CO4	H	H	-	-	H	-	-	-	H	-	-	H
CO5	H	L	-	-	H	-	-	-	H	-	-	H

COURSE NAME: WIRELESS SENSOR NETWORKS

COURSE CODE: DEEC-14711

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 10%-20%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 To Describe the operating principle, architecture along with Constraints and Challenges of wireless sensor .

CO2 To analyse topology control system.

CO3 Design transceiver and protocol for Wireless Sensor Network.

CO4 Demonstrate various Wireless Sensor Network platforms and tools.

CO5 Describe the concept of VANET (Vehicular Adhoc Networks).

Syllabus:

Unit 1 Introduction to Wireless Sensor Networks

Constraints and Challenges of sensor networks, Emerging technologies for wireless sensor networks, Node architecture, Hardware components overview, Energy consumption of Sensor nodes, Dynamic energy and power management on System level, some examples of Sensor nodes, Optimization goals and figures of merit, QOS, Energy Efficiency, scalability, robustness. Advantages of sensor networks, Sensor network applications.

Unit 2 Topology Control

Location driven, Geographic Adaptive Fidelity (GAF), Geographic Random Forwarding (GeRaF),GEAR, Connectivity driven, SPAN, ASCENT.

Unit 3 WSN Sensors

Physical Layer Design, Transceiver Design, MAC Protocols for WSN, Low Duty Cycle Protocols & Wakeup Concepts, S-MAC, Mediation Device Protocol, Wakeup Radio Concepts, Address &Name Management, Assignment of MAC Addresses, Routing Protocols, Energy Efficient Routing, Geographic Routing.

Unit 4 WSN Platforms & Tools

Sensor Node Hardware, Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

Unit 5 VANET (Vehicular Adhoc Networks)

Introduction and Motivation, V2X Communication Scenarios and Requirement, Architecture of ITS station, Regional Regulations.

Text Books:

1. Holger Karl & Andreas Willig, " Protocol and Architecture for wireless sensor networks, John Wiley 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless sensor Networks-An Information Processing Approach", Elesevier,2007.
3. Riccardo Scopigno, Antonella Molinaro, Claudia Campolo, "Vehicular ad hoc Networks: Standards, Solutions, and Research", Springer, 2015.

Reference Books:

1. WaltenegusDargie and Christian Poellabauer, "Fundamentals of Wireless Sensor Networks Theory and Practice", John Wiley and Sons,first edition,2010.

2. Holger Karl & Andreas Willig, "Protocol and Architecture for wireless sensor networks, John Wiley 2007.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
UNIT 1	H	-	-	-	-
UNIT 2	-	H	L	M	-
UNIT 3	-	L	H	-	-
UNIT 4	-	-	-	H	-
UNIT 5	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	M	-	M	-	-	-	-	M	-	-	-	L
CO2	M	-	-	-	-	-	-	-	-	-	-	-
CO3	M	-	M	-	-	-	-	-	-	M	-	-
CO4	H	-	-	-	-	-	-	-	-	L	-	-
CO5	-	-	-	-	-	-	-	-	-	H	-	-

COURSE NAME: OPERATION RESEARCH

COURSE CODE: DEEC-14712

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 80%-85%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Be able to understand characteristics of different types of decision making environments and appropriate decision making approaches and tools to be used in each type.

CO2 Solve linear programming problems using graphical method and simplex method

CO3 Design solution for solving transportation problem using transportation model.

CO4 Apply Hungarian method to solve assignment problem.

CO5 Solve sequencing problems using Johnson's algorithm.

CO6 Apply dynamic programming for various problem solving fields.

CO7 Implement games theory, which is mathematical theory for decision making.

Syllabus:

Unit 1 Introduction to Operation research

Introduction, Historical Background, Scope of Operations Research , Features of Operations Research, Phases of Operations Research, Types of Operations Research Models, Operations Research Methodology, Operations Research Techniques and Tools , Structure of the Mathematical Model, Limitations of Operations Research

Unit 2. Linear Programming

Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical Methods to Solve Linear Programming Problems, Applications, Advantages, Limitations Some Exceptional Cases, Standard Form of LPP, Fundamental theorem of LPP, Solution of LPP – Simplex Method, The Simplex Algorithm, Penalty Cost Method or Big M-method, Two Phase Method, Solved Problems on Minimisation, degeneracy and unbound solutions, procedure for resolving degenerate cases. Concept of duality, Importance of Duality Concepts, Formulation of Dual Problem, Economic Interpretation of Duality,

Unit 3. Transportation Problem

Formulation of transportation model, Optimality Methods, Unbalanced transportation problem, Basic feasible solution, Northwest corner rule, least cost method, Vogel's approximation method, MODI method. Applications of Transportation problems, Assignment Problem, Formulation, Hungarian method, unbalanced assignment problem, Travelling salesman problem.

Unit 4. Sequencing Model

Johnsons algorithm, Processing n Jobs through 2 Machines, Processing n Jobs through 3 Machines, Processing 2 Jobs through m machines, Processing n Jobs through m Machines, Graphical solutions priority rules.

Unit 5. Dynamic Programming

Characteristics of dynamic programming, Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.

Unit 6. Games Theory

Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2×2 games.

Text Books:

1. Hamdy A. Taha, "Operations Research – An introduction", Prentice Hall, 8th Edition, 2007.
2. J K Sharma., "Operations Research Theory & Applications , Macmillan India Ltd , 3rd edition, , 2007.

Reference books and other resources:

1. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6	CO7
UNIT 1	H	M	M	M	M	M	-
UNIT 2	M	H	-	-	-	-	-
UNIT 3	M	-	H	H	-	-	-
UNIT 4	M	-	-	-	H	-	-
UNIT 5	M	-	-	-	-	H	-
UNIT 6	M	-	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	-	-	-	H	-	-	-	-	-	M	H
CO2	H	-	-	-	H	-	-	L	-	-	M	H
CO3	H	-	-	-	H	-	-	L	-	-	-	H
CO4	H	-	-	-	H	-	-	L	M	-	M	H
CO5	H	-	-	-	H	-	-	L	-	-	-	H

CO6	H	-	-	-	H	-	-	L	-	-	M	H
CO7	H	-	-	-	H	-	-	L	M	L	M	H

COURSE NAME: MOBILE COMPUTING

COURSE CODE: DEEC-14713

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Define overview of wireless telephony and issues in mobile computing.

CO2 Explain the mobile networks and protocols related to transport layer.

CO3 Define the wireless application protocol and overview of wireless LAN.

CO4 Describe the various algorithms related to mobile adhoc networks

Syllabus:

Unit 1 Introduction

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, frequency reuse, hand off strategies, channel assignment, channel interferences, GSM: services and features, GSM system architecture, GSM channel structure, air interfaces.

Unit 2 Mobile Network & Transport Layer

Mobile IP Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, Dynamic Host Configuration Protocol (DHCP), Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit 3 Wireless Networking

Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP:Architecture, protocol stack, application environment, applications.

Unit 4 Mobile Ad hoc Networks

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment, Mobile Ad hoc Networks (MANETs): Overview, architecture of MANET, Properties of a MANET, application of MANET, various routing algorithms, security in MANETs.

Text Books:

1. J. Schiller, Mobile Communications, Addison-Wesley, second edition, 2004.
2. Theodore S Rappaport , wireless communications : principles & practice, second edition, Pearson publications.

Reference Books:

1. Raj Pandya, Mobile & Personal Communication Systems and Service, PHI.
2. Asoke k Talukder, Roopa R Yavagal, Mobile Computing , Technology, Application & Service Creation. Tata McGraw HillStojmenovic and Cacute, ―Handbook of Wireless Networks and Mobile Computing‖, Wiley, 2002.

Mapping of course contents with COs

Contents	CO1	CO2	CO3	CO4
Unit 1	H	-	-	-
Unit 2	-	H	-	-
Unit 3	L	-	H	-
Unit 4	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	M	-	-	-	M	-	-	L	-	-	-	-
CO2	H	-	-	-	-	-	-	-	-	M	-	-
CO3	H	-	-	-	-	-	-	-	-	-	-	-
CO4	M	-	-	-	-	-	-	-	-	M	-	L

COURSE NAME: NUMERICAL METHODS IN ENGINEERING

COURSE CODE: DEEC-14714

Internal Marks: 40	**L**	**T**	**P**
External Marks: 60	**3**	**1**	**-**

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Analyze absolute, relative and percentage error.

CO2 Solve the system of linear equations.

CO3 Solve the system of non linear equations.

CO4 Solve the stability and fracture problems with the help of lowest eigen value.

CO5 Describe the process of interpolation.

CO6 Solve the equations which have no solution using numerical integration.

CO7 Solve first and second order ordinary differential equation.

Syllabus

Unit 1. Error Analysis

Exact and Approximate numbers, rounding of numbers, Significant digits, correct digits, various types of errors encountered in computations, Propagation of errors.

Unit 2. Solution of system of linear equations

(I) Direct/Indirect Methods: Gauss elimination method without pivoting and with pivoting, LU-decomposition method

(II) Iterative methods, Jacobi and Gauss- Seidal methods.

Unit 3. Roots of Non linear equations

Bisection method, Regula falasi method, Newton Raphson method, direct iterative method with convergence criteria, Newton Raphson method for solution of a pair of non linear equation.

Unit 4.Eigen Values and Eigen Vectors

Dominant and Smallest values/Eigen vectors by power method.

Unit 5. Interpolation

Finite Difference operator and their relationships, Difference tables, Newton, Bessel and Stirling interpolation formulae, Divided Differences, Lagranges Interpolation and Newton's divided interpolation.

Unit 6. First and second order derivative by various interpolation formulae.

Unit 7. Numerical Integration

Trapezoidal, Simpson's 1/3 and 3/8 rule with errors and their combination, Boole's and Weddle Rule.

Unit 8. Solution of first and second order ordinary differential equation

Picard's method, Taylor's series method, Eulers Method, Modified Euler's method-K method and Mile's Predictor-corrector method.

Text Books:

1. Jain M.K, Iyengar, S.R.K and Jain RK Numerical Methods for Scientific and Engg. Computation, New Age Pvt. Pub New Delhi.
2. Krishnamurthy, E.V and Sen, S.K., Applied Numerical Analysis East west Publication.
3. Rao V, Dukkipati, New Age International Publishers.

Reference books:

1. Gerald.C.F and Wheatly,P.O, Applied Numerical Analysis WESLEY

2. Conte,S.D and DeBoor,C., Elementary numerical Analysis ,McGraw Hill Publisher.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5	CO6	CO7
UNIT 1	H	-	-	-	-	-	-
UNIT 2	-	H	-	-	-	-	-
UNIT 3	-	-	H	-	-	-	-
UNIT 4	-	-	-	H		-	-
UNIT 5	-	-	-	-	H	-	-
UNIT 6	-	-	-	-	H	-	-
UNIT 7	-	-	-	-	-	H	-
UNIT 8	-	-	-	-	-	-	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	-	-	-	-	-	-	-	-	-	-	-
CO2	H	-	-	-	H	-	-	-	-	-	-	-
CO3	H	-	-	-	H	-	-	-	-	-	-	-
CO4	H	-	-	-	H	-	-	-	-	-	-	-
CO5	H	M	H	-	H	-	-	-	-	-	H	-
CO6	H	-	H	-	H	-	-	-	-	-	H	-
CO7	H	-	H	-	H		-	-	-	-	H	-

COURSE NAME: LAB OPTICAL COMMUNICATION

COURSE CODE: EC-14715

	L	T	P
Internal Marks: 30			
External Marks: 20	**-**	**-**	**2**

NOTE: Do all Experiments. Evaluation of the lab work shall be done as per the approved Rubric.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Demonstrate the working of optical fiber communication system and analyze the propagation and bending loss of fiber.

CO2 Measure the numerical aperture, sensitivity and power and BER in optical fibers.

CO3 Demonstrate PWM and WDM transmission through optical fiber.

CO4 Understand the V-I characteristics of LED and photo detector.

Syllabus:

Experiment 1. To demonstrate fiber optic analog and digital link.

Experiment 2. To Study and measurement of propagation loss in optical fiber.

Experiment 3. To demonstrate and measurement of bending loss in optical fiber.

Experiment 4. To demonstrate and measurement of numerical aperture of optical fiber.

Experiment 5. To Measure the optical power using optical power meter.

Experiment 6. To demonstrate Voice Transmission through optical fiber using PWM.

Experiment 7. To measure the sensitivity of the fiber optic link.

Experiment 8. To demonstrate V-I characteristics of fiber optic LEDs.

Experiment 9. To demonstrate V-I characteristics of photo detector.

Experiment 10. To demonstrate transmission of WDM signal through optical fiber using Optisystem.

Reference Books and Other Resources:

Lab manuals available in lab.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4
Experiment 1	H	-	-	-
Experiment 2	H	-	-	-
Experiment 3	H	-	-	-
Experiment 4	-	H	-	-
Experiment 5	-	H	-	-
Experiment 6	-	-	H	-
Experiment 7	-	H	-	-
Experiment 8	-	-	-	H
Experiment 9	-	-	-	H
Experiment 10	-	-	H	-

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	H	L	-	H	-	-	L	-	-	H	L
CO2	H	H	L	-	H	-	-	L	-	-	H	L
CO3	H	H	L	-	H	-	-	L	-	-	H	L
CO4	H	H	L	-	H	-	-	L	L	-	H	L

COURSE NAME: LAB VLSI DESIGN

COURSE CODE: EC-14716

Internal Marks: 30	**L**	**T**	**P**
External Marks: 20	**-**	**-**	**2**

NOTE: Do all Experiments. Evaluation of the lab work shall be done as per the approved Rubric.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Design basic and universal gates, adder and subtractor using VHDL.

CO2 Design multiplexers, demultiplexers, encoders and decoders.

CO3 Design code converters, parity generator and comparator using various styles of modeling.

CO4 Design sequential circuits like counters, shift registers and flip-flops.

CO5 Implement digital circuit on FPGA kit.

Syllabus:

Perform the following experiments using VHDL:

Experiment 1. Design of gates: AND, OR, NOT, NAND and NOR.

Experiment 2. Design of Half-Adder and Full Adder.

Experiment 3. Design of Half Subtractor and Full Subtractor.

Experiment 4. Design of 4:1 MUX.

Experiment 5. Design of 1:8 DEMUX.

Experiment 6. Design of 3:8 Decoder.

Experiment 7. Design of 8:3 Priority Encoder.

Experiment 8. Design of 4 Bit Binary to Grey code Converter.

Experiment 9. Design of 4 Bit Binary to BCD Converter using sequential statement.

Experiment 10. Design of 4-Bit Binary to Excess-3 converter using sequential statement.

Experiment 11. Design of 9-Bit parity generator using structural style.

Experiment 12. Design of 4-bit comparator.

Experiment 13. Design of all type of Flip-Flops using sequential statements.

Experiment 14. Design of 8-Bit Shift Register.

Experiment 15. Design of Synchronous 8-bit Johnson Counter.

Experiment 16. Design of Synchronous 8-Bit universal shift register.

Experiment 17. Design of counters: MOD 5, MOD 16.

Experiment 18. Design of a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.

Experiment 19. Study of FPGA/CPLD universal kits.

Experiment 20. Implementation of 1:4 DEMUX on FPGA kit.

Reference Books and Other Resources:

Lab manuals available in lab.

Mapping of course contents with CO

Contents	CO1	CO2	CO3	CO4	CO5
Experiment 1	H	-	-	-	-
Experiment 2	H	-	-	-	-
Experiment 3	H	-	-	-	-
Experiment 4	-	H	-	-	-
Experiment 5	-	H	-	-	-
Experiment 6	-	H	-	-	-
Experiment 7	-	H	-	-	-
Experiment 8	-	-	H	-	-
Experiment 9	-	-	H	-	-
Experiment 10	-	-	H	-	-
Experiment 11	-	-	H	-	-
Experiment 12	-	-	H	-	-

Experiment 13	-	-	-	H	-
Experiment 14	-	-	-	H	-
Experiment 15	-	-	-	H	-
Experiment 16	-	-	-	H	-
Experiment 17	-	-	-	H	-
Experiment 18	-	-	-	H	-
Experiment 19	-	-	-	-	H
Experiment 20	-	-	-	-	H

Mapping of CO with PO

CO	**PO**											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	H	L	M	M	-	-	-	-	-	H	L
CO2	H	H	L	M	M	-	-	-	-	-	H	L
CO3	H	H	L	M	M	-	-	-	-	-	H	L
CO4	H	H	L	M	M	-	-	-	-	-	H	L
CO5	H	H	L	M	M	-	-	-	-	H	H	L

COURSE NAME: MAJOR PROJECT

COURSE CODE: PREC-14701

	L	T	P
Internal Marks: 120			
External Marks: 80	**-**	**-**	**3**

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Understand the designing concepts of projects based on electronics/ communication field.

CO2 Develop the projects based on electronics/ communication field.

Syllabus:

Students may choose a project based on any subject of Electronics and Communication Engineering. The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports. Evaluation of the project work shall be done as per the approved Rubrics.

Reference Books and Other Resources:

Various projects based magazines available in the college/department library.

Mapping of course contents with CO

Contents	CO1	CO2
Major Project	H	H

Mapping of CO with PO

CO	PO											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1	H	H	H	H	M	M	-	L	L	L	L	L
CO2	H	H	H	H	M	M	-	L	L	L	L	L