### VII Semester

<table>
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<tr>
<th>Sl. No</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>1</td>
<td>UEC711C</td>
<td>Transmission Lines and Microwave Eng.</td>
<td>4.0</td>
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<tr>
<td>2</td>
<td>UEC712C</td>
<td>Antenna and Wave Propagation</td>
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<td>9</td>
<td>UEC725P</td>
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<td>High Speed Networks and Internets</td>
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#### Elective - VI

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<td>UEC717E</td>
<td>ARM Processors</td>
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<td>2</td>
<td>UEC718E</td>
<td>Real Time Systems</td>
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<td>3</td>
<td>UEC719E</td>
<td>Industrial Automation</td>
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#### Elective - VII

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<td>CMOS Analog VLSI Design</td>
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<td>2</td>
<td>UEC721E</td>
<td>Low Power VLSI Design</td>
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<td>3</td>
<td>UEC722E</td>
<td>Digital Signal Processing with FPGA</td>
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## Course Title: Transmission Lines and Microwave Engineering

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### Unit I

Introduction to Microwaves: Microwave frequencies, IEEE Microwave frequency bands. Microwave transmission lines and waveguides: Introduction, Transmission line equations and solutions, Reflection and transmission coefficients, Standing wave and SWR, Line impedance and line admittance, Smith chart, Impedance matching using single stubs, Microwave co-axial connectors, Microstrip lines, Introduction to rectangular waveguides, TE&TM modes in rectangular waveguide.

### Unit II


### Unit III

Microwave linear beam tubes: Introduction, Reflex klystron, Mechanism of oscillation, Mode of oscillations, Power output and efficiency, Mode curve, Two cavity klystron as an amplifier, Helix travelling wave tube amplifier (TWTA), Comparison between klystron and TWTA. Microwave solid state devices (Quantitative analysis): Transferred Electron Devices - Introduction, Gun effect diodes, RWH theory, Modes of operation. Avalanche Transit Time Devices - Introduction, Read diode, IMPATT diode, TRAPATT diode, BARITT diode, Other diode: PIN diode.

### Unit IV

Microwave measurements: Introduction, Tunable detector, Slotted line carriage, VSWR meter, Insertion loss and attenuation measurements, VSWR measurements, Impedance and frequency measurements. Microwave applications: Microwave radar systems - Basic radar, Simple form of radar equation, Radar block diagram, Radar frequencies, Applications of radar. MTI and pulse Doppler radar - Doppler effect, CW radar, Block diagram of MTI radar and pulse Doppler radar.
### Text Books


### Reference Books

**Course Title:** Antenna and Wave Propagation  
**Course Code:** UEC712C  
**Credits:** 4  
**Teaching Hours:** 52 Hrs (13 Hrs/Unit)  
**Contact Hours:** 4 Hrs/Week  
**CIE Marks:** 50  
**SEE Marks:** 50  
**Total Marks:** 100

### Unit I

Basic antenna concepts: Principle of radiation, isotropic source, radiation pattern, beam solid angle, radiation intensity, directivity, effective aperture, gain, polarization, impedance, poynting vector, dipole antenna, Friis transmission formula, duality of antennas. Point sources: Definition, power patterns.

### Unit II

Array of two point sources, Broad side array, end fire array, n-isotropic array, evaluation of null directions and maxima, amplitude distributions, pattern multiplication. Binomial, parasitic, and Chebyshev arrays, phased array, Antenna as an aperture: Aperture concept, types of aperture, maximum effective aperture of short dipole and half wave dipole.

### Unit III


### Unit IV


### Text Books


### Reference Books

<table>
<thead>
<tr>
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<th>Course Code: UEC713C</th>
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**Unit I**


**Unit II**


**Unit III**


**Unit IV**

Optical components: Couplers, Isolators, Circulators, Multiplexers, Filters, Gratings, Interferometers, Amplifiers. Optical Networks: SONET/SDH, Multiplexing, ATM, IP, Storage Area Networks.

**Text Books**


**Reference Books**

<table>
<thead>
<tr>
<th>Course Title: High Speed Networks and Internets</th>
<th>Course Code: UEC714E</th>
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Unit I


Unit II


Unit III

TCP and ATM Congestion Control: TCP Flow control, TCP Congestion Control, Retransmission, Timer Management, Exponential RTO backoff, KARN's Algorithm, Window management, Performance of TCP over ATM. Traffic and Congestion control in ATM, Requirements, Attributes, Traffic Management Frame work, Traffic Control, ABR traffic Management, ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

Unit IV

Integrated and Differentiated Services: Integrated Services Architecture, Approach, Components, Services, Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ, Random Early Detection, Differentiated Services

Text Book


Reference Book

<table>
<thead>
<tr>
<th>Course Title: Multimedia Communications</th>
<th>Course Code: UEC715E</th>
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<td>Teaching Hours: 40 Hrs (10 Hrs/Unit)</td>
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**Unit I**

Multimedia Communications: Introduction, multimedia information representation, multimedia networks, multimedia applications, applications and networking terminology. Multimedia Information Representation: Digitization principles, text, and images, audio, video.

**Unit II**


**Unit III**


**Unit IV**

MPEG Video coding: Overview, MPEG-1, MPEG-2, Object-Based Visual Coding in MPEG-synthetic object coding in MPEG, MPEG-4 Object types, Profiles and levels, MPEG-Part10/H.264, MPEG-7 Basic Audio and MPEG Audio Compression Techniques: ADPCM in speech coding, G.726 ADPCM. Vocoders, Psychoacoustics, MPEG Audio, other commercial Audio codes, future: MPEG-7 and MPEG-2.

**Text Book**

1) Ze-Nain Li and M.S.Drew, “Fundamental of Multimedia:”, Pearson Education.

Reference Books

Course Title: Fuzzy Logic

Course Code: UEC716E

Credits: 3  Teaching Hours: 40 Hrs
          (10 Hrs/Unit)  Contact Hours: 3 Hrs/Week

CIE Marks: 50  SEE Marks: 50  Total Marks: 100

Unit I


Unit II


Unit III


Unit IV


Text Books

Reference Books

<table>
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<th>Course Title: ARM Processors</th>
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</table>

**Unit I**

An Introduction to processor design: Processor architecture and organization, Abstraction in Hardware design, MU0—A Simple processor, Instruction set design, Processor design trade-offs, The reduced instruction set computer, Design for low power consumption. The ARM architecture: The Acorn RISC machine, Architectural inheritance, The ARM programmers model, ARM organization and implementation: 3-stage pipeline ARM organization, 5-stage pipeline ARM organization.

**Unit II**

Architectural Overview: The ARM floating-point architecture, ARM processor cores: ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI. The ARM system control coprocessor, CP15 protection unit registers, ARM protection unit, CP15 MMU registers, ARM MMU architecture, ARM CPU cores: The ARM710T, ARM720T, and ARM740T.

**Unit III**


**Unit IV**

Interfacing ARM processors for dedicated Applications: Timers, Real Time Clock and RTC interrupts, WatchDog Timer, UART, I2C and SPI interfaces. Typical programming examples. IDE for ARM application development and Flash utility.

**Text Books**

Reference Book

1) Embedded Software in C for an ARM Cortex M - Jonathan W. Valvano and Ramesh Yerraballi
<table>
<thead>
<tr>
<th>Unit I</th>
</tr>
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<table>
<thead>
<tr>
<th>Unit II</th>
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<tbody>
<tr>
<td>Task Assignment and Scheduling: Classical uniprocessor scheduling algorithms, uniprocessor scheduling of IRIS Tasks, Task management, fault tolerant scheduling. Real Time communication: Network topologies, protocols.</td>
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</table>

<table>
<thead>
<tr>
<th>Unit III</th>
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</thead>
<tbody>
<tr>
<td>Clock Synchronization: Clock, impact of faults, fault tolerant synchronization in software. Real Time Operating Systems: OS services, I/O subsystems, network OS, Real Time and embedded systems OS, RTOS Task scheduling models, performance metrics, synchronization issues, embedded Linux Internals, OS security.</td>
</tr>
<tr>
<td>Reference Books</td>
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<tr>
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<tr>
<td>3) An Embedded software Primer- David E. Simon, Pearson Education, 1999</td>
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**Course Title:** Industrial Automation  
**Course Code:** UEC719E  
**Credits:** 3  
**Teaching Hours:** 40 Hrs (10 Hrs/Unit)  
**Contact Hours:** 3 Hrs/Week  
**CIE Marks:** 50  
**SEE Marks:** 50  
**Total Marks:** 100

**Unit I**

**Unit II**
PLC Instructions: The basic relay instructions normally open and normally closed instructions, Output latching instructions, Understanding relay instructions and the programmable controller input modules, Interfacing start stop pushbutton and motor to PLC, Developing ladder diagram with analytical problems.

**Unit III**
Timer and counter Instructions: On delay and off delay and retentive timer instructions, PLC counter up and down instructions, Combining counters and timers, Developing ladder diagram with analytical problems. Comparison and data handling instructions: Data handling instructions, Sequencer instructions - Programming sequence output instructions, Developing ladder diagram with analytical problems.

**Unit IV**

**Text Books**
1) Garry Dunning, “Introduction to Programmable Logic Controllers”, 2nd Edition. Thomson,


Reference Books


3) W. Bolton, “Industrial Control and Instrumentation”, Universities Press.
<table>
<thead>
<tr>
<th>Course Title: CMOS Analog VLSI Design</th>
<th>Course Code: UEC720E</th>
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**Unit I**

Introduction and Background: Analog integrated circuit design, notation, symbology and terminology, analog signal processing. CMOS Technology: The pn-junction, the MOS transistor, passive components. Analog CMOS Sub circuits: MOS switch, MOS diode/active resistor, current sinks, and current sources.

**Unit II**

Analog CMOS Sub circuits: Current mirrors, current and voltage references, bandgap references. CMOS Amplifiers: Inverters

**Unit III**

CMOS Amplifiers: Differential amplifier, cascade amplifier, current amplifier, output amplifier, high gain amplifier architecture. CMOS Operational Amplifiers: Design of CMOS op-amps.

**Unit IV**

CMOS Operational Amplifiers: Compensation of op-amps, design of two stage op-amps, power supply rejection ratio of two stage op-amps, cascade op-amps, simulation and measurements of op-amps, macro models of op-amps.

**Text Book**


**Reference Books**

### Course Title: Low Power VLSI Design

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### Unit I


### Unit II


### Unit III

Power Estimation: power estimation at the circuit level, high level power estimation, information theory based approaches, estimation of maximum power. Synthesis for Low Power: Behavioral level transform, logic level optimization for low power.

### Unit IV

Synthesis for Low Power: Circuit level. Design and Test of Low Voltage CMOS Circuits: Introduction, circuit design style, leakage current in deep sub micrometer transistors, deep sub micrometer device design issues, key to minimizing SCE, low voltage circuit design techniques, testing deep sub micrometer ICs with elevated intrinsic leakage, multiple supply voltage.

### Text Book


### Reference Books

<table>
<thead>
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<th>Course Title: Digital Signal Processing with FPGA</th>
<th>Course Code: UEC722E</th>
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**Unit I**

**Unit II**
## Unit III


## Unit IV

Finite Impulse Response (FIR) Digital Filters: Digital Filters, FIR Theory, 3.2.1 FIR Filter with Transposed Structure, Symmetry in FIR Filters, Linear-phase FIR Filters, Designing FIR Filters, Direct Window Design Method, equiripple design Method.

Constant Coefficient FIR Design: Direct FIR Design, FIR Filter with Transposed Structure, FIR Filters Using Distributed Arithmetic, IP Core FIR Filter Design, Comparison of DA- and RAG-Based FIR Filters.

## Text Book


## Reference Books

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**List of Experiments**

1) Characteristic of Transmission line.
2) Measuring attenuation of a transmission line.
3) Frequency characteristic of a transmission line.
4) Measurement of numerical aperture of optical fiber.
5) Characteristic of low pass filter using microstrip filter.
6) Characteristic of band pass filter using microstrip filter.
7) Characteristic of band stop filter using microstrip filter.
8) Measurement of resonance of a microstrip ring resonator.
9) Study of signal sampling and reconstruction.
10) Study of pulse amplitude modulation
11) Study of TDM modulation and demodulation
12) Study of PWM modulation and demodulation
Course Title: Advanced Microprocessor Laboratory

Course Code: UEC724L

Credits: 1.5
Contact Hours: 3 Hrs/Week
CIE Marks: 50 | SEE Marks: 50 | Total Marks: 100

List of Experiments

1) Programs involving data transfer instructions
   a) To move word data using different addressing modes
   b) To move data block with overlap & without overlap
   c) To interchange two blocks of data

2) Programs involving arithmetic & logical instructions
   a) To add & subtract multi precision numbers
   b) To multiply two signed & unsigned numbers
   c) To divide signed & unsigned numbers
   d) To convert HEX to ASCII number
   e) To convert ASCII to HEX number
   f) To find square, cube & factorial of a given number
   g) To find GCD & LCM of a given two numbers
   h) To evaluate the following expression E=4B+[C+D].

3) Programs involving Shift & Rotate instructions
   a) To count the positive & negative numbers in an array
   b) To count the EVEN & ODD numbers in an array
   c) To check the palindrome of a number
   d) To check the 2 out of 5 code
   e) To count 1s & 0s in a given number

4) Programs involving branch/loop instructions
   a) To find the biggest & smallest of a number in a array
   b) To sort the numbers in a ascending/ descending order
   c) To find the addition of two matrices
d) To find the norm of a matrix

e)

5) Programs involving string instructions

a) To transfer string from one location to another
b) To check the string palindrome
c) To find the length of a string
d) To find the concatenated string
e) To search a word in a sentence
f) To display system time
g) To display the system date

6) Interfacing programs

A) Logic controller interface
   i.  Ring counter
   ii.  Johnson counter
   iii. BCD up/Down counter
   iv.  Data display

B) DAC controller interface
   i.  Sine signal generation
   ii.  Triangular signal generation
   iii. Saw tooth signal generation
   iv.  Square signal generation

C) Stepper motor controller interface
   i.  Clock wise moment
   ii.  Anti clockwise moment

D) Seven segment LED display interface
   i.  Character/data display
The project work shall be based on the knowledge acquired by the student during the graduation and preferably it should meet and contribute towards the needs of the society. The project aims to provide an opportunity of designing and building complete system or subsystems based on area where the student likes to acquire specialized skills.

Project work in the seventh semester is an integral part of the project work of phase II in eighth semester. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview, scheme of implementation.

As a part of the progress report of Project work, the candidate shall deliver a presentation on the progress of his/her project work along with advancement in technology pertaining to the selected Project topic.