UNITED STATES OF KERALA

B. TECH. DEGREE COURSE
(2013 SCHEME)

SYLLABUS FOR
VI SEMESTER
APPLIED ELECTRONICS and INSTRUMENTATION ENGINEERING
### SCHEME -2013

#### VI SEMESTER

**APPLIED ELECTRONICS and INSTRUMENTATION ENGINEERING (A)**

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<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Marks</th>
<th>Total Marks</th>
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<td>13.601</td>
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<td>50</td>
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<td>13.602</td>
<td>Programming in C++ and Data Structures (A)</td>
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<td>13.603</td>
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**13. 606 Elective II**

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<th>Course No</th>
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13.601 IMAGE PROCESSING (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objective:

The students undergoing this course will be able to know.
- Fundamentals of image processing.
- Various transforms used in image processing.
- Image processing techniques like image enhancement, reconstruction, compression and segmentation.

Module – I


Two dimensional systems - 2-D convolution, 2-D correlation

Image transforms: 2-D Discrete Fourier transform – properties, Discrete Cosine, Walsh, Hadamard and Haar transforms.

Module – II

Image Enhancement: Point Operations - Spatial Filters, Filter Masks, Smoothing Filters, Sharpening Filters, High Boost Filters - Frequency domain Filters, Smoothing Filters, Sharpening Filters, Homomorphic filters – Histogram Processing


Module – III


Module – IV

Morphological Processing- erosion and dilation, opening and closing, Hit/Miss transformation, Boundary Extraction, Hole Filling, Convex Hull, Thinning, Thickening and Pruning.
Image Compression: Image Compressions models – Huffmann Coding - Arithmetic Coding – Image Compression Standards.


References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

*Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

*Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.*

*Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.*

Course Outcome:

*After successful completion of this course, the students will be able to know the fundamental concepts of image processing.*
Course Objective:

- To learn and practice concepts of object oriented programming
- To learn about various data structures.

Module – I


Module – II

Function overloading, operator overloading, friend function, derived class (inheritance), polymorphism, virtual function, templates, Files and streams. Library functions for File and String operations. Introduction to Standard Template Library. Programming tools- make files, debuggers, revision control systems, exception handling.

Module – III

Data Structures: Linked (single and double) lists - basic operations. Linked list implementation of Stack - basic operations, Queues - basic operations. Binary Tree- basic operations. Binary Search Tree, Binary tree traversal (in order, preorder, post order).

Module – IV

Sorting Algorithms- bubble sort, shell sort, merge sort, quick sort, heap sort. Comparison of Sorting algorithms by Speed and Space. Order (Big-O), Average, Best, Worst case running time of Algorithms.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours  Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After successful completion of the course, students will be familiar with data structures and they will develop skills in object oriented programming.
13.603 PROCESS DYNAMICS & CONTROL (A)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

- To learn about various processes and controllers
- To learn different control elements and controlling methods

Module – I

Process Control System: Terms and objectives, piping and Instrumentation diagram, instrument terms and symbols. Regulator and servo control, classification of variables.


Module – II


Module – III


Advanced control system: Cascade control, ratio control, feed forward control. Over-ride, split range and selective control. Multivariable process control, interaction of control loops.

Module – IV


References:

1. George Stephenopoulos: Chemical Process Control, 2/e, PHI.

Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of the course, the students will be familiar with various processes and controllers, control elements and controlling methods.
13.604 BIOMEDICAL INSTRUMENTATION (A)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

- To familiarize terminology used in biomedical engineering
- To give an understanding of working of various instruments used in medical fields
- To study the recent trends in biomedical engineering

Module – I


Module – II

Respirator and pulmonary measurements and rehabilitation - Physiology of respiratory system, respiratory rate measurement, artificial respirator, oximeter, hearing aids, functional neuromuscular simulation, physiotherapy, diathermy, nerve stimulator, artificial kidney machine.

Module – III

Patient monitoring systems - Intensive cardiac care, bedside and central monitoring systems, patient monitoring through bio-telemetry, implanted transmitters, telemetering multiple information. Sources of electrical hazards and safety techniques.

Module – IV

Recent trends - Medical imaging, X-rays, laser applications, ultrasound scanner, echo cardiology, CT Scan MRI/NMR, cine angiogram, colour doppler systems, Holter monitoring, endoscopy. Bioinformatics – Introduction, protein information resources, genome information resources, DNA sequence analysis, Pairwise alignment techniques.

References:

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, *Biomedical Instrumentation and Measurements*, 2/e, PHI.

**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After the completion of this course, students will be familiarized with medical imaging equipment and techniques. Construction and physiology of measurement and monitoring devices will also be familiarized as a part of this course.
13.605 ANALOG & DIGITAL COMMUNICATION (A)

Teaching Scheme: 3(L) - 1(T) - 0(P)       Credits: 4

Course Objective:

- To learn fundamental aspects of analog and digital communications
- To learn about relative merits and demerits of analog and digital communication systems

Module – I

Amplitude modulation - Modulation Index, Modulation Index for Sinusoidal AM, Average power for sinusoidal AM, Effective Voltage and Current for Sinusoidal AM, DSBSC Modulation, Amplitude Modulator Circuits, Amplitude Demodulator Circuits, Diagonal Peak Clipping, AM Transmitters – Broadcast Transmitters.


Module – II


Module – III


Module – IV

Spread spectrum communication - Pseudo–noise sequences, Properties of PN sequences. Generation of PN Sequences, generator polynomials, Maximal length codes and Gold Codes. Spread spectrum communication– Notion of spread spectrum, Direct sequence spread
spectrum with coherent binary phase shift keying, Signal space dimensionality and processing gain, Diversity techniques - Diversity in time, frequency and space. TDMA and CDMA.

References:

2. Dennis Roody and John Coolen, *Electronic Communication*, 4/e, PHI.
3. Wayne Tomasi, *Advanced Electronic Communications Systems*, 6/e, PHI.
10. George Kennedy,*Communication Systems*, 3/e, TMH.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the completion of this course, the students will be familiarized with fundamentals of analog and digital communication systems. They will able to compare analog and digital communication systems in terms of their requirements and performance.
13.606.1 SPEECH PROCESSING (AT) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)  Credits: 3

Course Objective:

To study the Speech recognition, Identification, spectrum estimation

Module – I

Nature of Speech Signal: Speech production mechanism, Classification of speech sounds, Nature of speech signal.

Module – II

Time Domain Methods: Time-domain parameters of speech, methods for extracting the parameters, zero crossings, autocorrelation function, pitch estimation.
Digital representation of Speech Waveform: Sampling speech signals, Review of statistical model for speech, Instantaneous quantization, Adaptive quantization, DPCM with adaptive quantization and with adaptive prediction, PCM to ADPCM conversion.

Module – III

Frequency Domain Methods: Short time Fourier analysis, Filter back analysis, Spectrographic analysis, Formant extraction, Pitch extraction, Analysis – synthesis system.

Module – IV

Linear Predictive coding of Speech: Formulation of Linear Prediction problem in time domain, solution of normal equations, interpretation of linear prediction in auto correlation and spectral domains.

References:-


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours               Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the completion of the course the student will be able to know the Speech recognition, Identification, spectrum estimation
13.606.2 ADAPTIVE SIGNAL PROCESSING (AT) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

- Understand the concepts of gradient and mean square error performance in adaptive systems
- Explain gradient descent algorithms and gradient estimate
- Derive LMS algorithms and formulate conditions of convergence
- Explain applications of adaptive signal processing

Module – I

Adaptive systems: definitions and characteristics, Open and Closed loop adaptation, Adaptive linear combiner, Performance function, Gradient and minimum mean square error, performance function, Gradient and minimum mean square error, Alternate expressions of gradient.

Theory of adaptation with stationary signals: Input correlation matrix, Eigen values and Eigen vectors of the i/p correlation matrix.

Module – II

Searching the performance surface: Basic ideas of gradient search, Stability and rate of convergence, Learning curve, Newton's method, Steepest descent method, Comparison.

Gradient estimation and its effects on adaptation: Gradient component estimation by derivative measurement, performance penalty, Variances of the gradient estimate, effects on the weight - vector solution, Excess mean square error and time constants, misadjustments, total misadjustments and other practical considerations.

Module – III


Module – IV

References:

6. Tamal Bose, Digital Signal and Image processing, John Wiley publications.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the course the student will be able to

- Understand the concepts of gradient and mean square error performance in adaptive systems
- Apply gradient descent algorithms, gradient estimate and LMS algorithms in adaptive systems and formulate conditions of convergence
- Implement applications of adaptive signal processing
13.606.3 DSP SYSTEM AND ARCHITECTURE (AT) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)  

Credits: 3

Course Objectives:

- To impart the knowledge of basic DSP filters and number systems to be used and of different types of A/D, D/A conversion errors.
- To gain concepts of digital signal processing techniques, implementation of DSP & FFT algorithms and also to learn about interfacing of serial & parallel communication devices to the processor.

Module – I


Module – II

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

Module – III

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Module – IV

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After successful completion of the course, students will be

- familiar with the concepts of digital signal processing techniques, basic building blocks and implementation of DSP & FFT algorithms.
- able to programme the DSP TMS320C54XX PROCESSOR and decimation interpolation filters/adaptive filters
- apply interfacing of serial & parallel communication devices to the processor.
13.606.4 PROFESSIONAL ETHICS (AT) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

- To create awareness on professional ethics for engineers.
- To instil human values and integrity.
- To respect the rights of others and develop a global perspective.

Module – I
Understanding Professional Ethics and Human Values  
Current scenario, contradictions, dilemmas, need for value education and self esteem, Human values, morals, values, integrity, civic virtues, work ethics, respect for others, living peacefully, caring, honesty, courage, valuing time, co operation, commitment, empathy, self confidence, character.

Module – II
Ethics for Engineers, its importance, code of ethics, person and virtue, habits and morals, 4 main virtues, ethical theories, Kohlberg’s theory, Gilligan’s theory, towards a comprehensive approach to moral behaviour, truth, approach to knowledge in technology, environmental ethics and sustainability, problems of environmental ethics in engineering.

Module – III
Engineering as people serving profession, engineer’s responsibility to environment, principles of sustainability, industrial, economic, environmental, agricultural and urban sustainability, Sustainable development. Responsibility for safety and risk, types of risk, designing for safety, risk benefit analysis.

Module – IV
Professional rights and responsibilities, sense of loyalty, confidentiality, knowledge gained confidentiality, collective bargaining, conflict of interest, occupational crime, acceptance of bribes/gifts, Global Issues, computer ethics, weapons development, engineers as expert witness and advisors, ethics and research, Intellectual Property Rights, ethical audit and procedure.

References:
2. Govindarajan, Natarajan, Senthil Kumar, Engineering Ethics, PHI, 2009


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours
- Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After the completion of this course, student will be familiar with the human values and ethics in engineering.
13.606.5 WAVELETS & APPLICATIONS (AT) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

- Understand Short Time Fourier Transform
- Explain theory of frames
- Derive basic postulates in CWT and DWT and explain multi resolution analysis
- Understand orthonormality and fast wavelet transform algorithms
- Explain applications of wavelet transforms

Module – I


Module – II

Wavelets - The basic functions, Specifications, Admissibility conditions, Continuous wavelet transform (CWT), Discrete wavelet transform (DWT).

The multiresolution analysis (MRA) of L2(R) - The MRA axioms, Construction of an MRA from scaling functions.

Module – III

The dilation equation and the wavelet equation, Compactly supported orthonormal wavelet bases - Necessary and sufficient conditions for orthonormality.

Wavelet transform - Wavelet decomposition and reconstruction of functions in L2(R). Fast wavelet transform algorithms - Relation to filter banks, Wavelet packets.

Module – IV

Wavelet Transform Applications: Image processing - Compression, Denoising, Edge detection and Object detection. Audio - Perceptual coding of digital audio. Wavelet applications in Channel coding.

References:

1. Vaidyanathan P. P., Multirate Systems & Filter Banks, PTR, PH, 1993
2. Gilbert Strang, Linear Algebra and its Applications.


**Internal Continuous Assessment** *(Maximum Marks-50)*

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, problems based on MATLAB / any other software packages covering the syllabus etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours
- Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A** (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B** (80 Marks) - Candidates have to answer two full question out of the three from each module. Each question carries 10 marks.

**Note:** Question paper should contain minimum 60% Numerical Problems/derivations/proofs.

**Course Outcome:**

At the end of the course, the student shall be able to

- Understand Short Time Fourier Transform
- Explain theory of frames
- Derive basic postulates in CWT and DWT and explain multi resolution analysis
- Understand orthonormality and fast wavelet transform algorithms
- Explain applications of wavelet transforms
13.606.6 OPTIMIZATION TECHNIQUES (A) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

To learn concepts of linear programming and the methods of optimization.

Module – I

Unconstrained optimization: Necessary and sufficient conditions for local minima, One dimensional search methods, Gradient methods - Steepest descent, Inverse Hessian, Newton’s method, Conjugate direction method, Conjugate gradient algorithm, Quasi Newton methods.

Module – II

Linear Programming: Convex polyhedra, Standard form of linear programming, Basic solutions, Simplex algorithm, Matrix form of the simplex algorithm, Duality, Non simplex methods: Khachiyan method, Karmarkar’s method.

Module – III


Module – IV

Genetic Algorithms - basics, design issues, convergence rate, Genetic Algorithm methods.

References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

The question paper shall consist of 2 parts.
Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:
After the completion of this course, students will be familiar with various optimization techniques and their areas of application.
13.606.7 ELECTROMAGNETICS (A) (Elective II)

Teaching Scheme: 2(L) - 1(T) - 0(P)        Credits: 3

Course Objective:

- To learn fundamentals of electromagnetic theory
- To learn applications of electromagnetic theory in antenna design and wave propagation

Module – I

Review of vector geometry – Spherical and cylindrical coordinate systems- Maxwell's equations, TEM modes in a linear homogenous isotropic medium, polarization, Pointing vector and power flow, TEM waves incident on a boundary - Snell's laws, wave propagation inside a conductor -skin depth, phase and group velocity.

Module – II

Multi-conductor Transmission Lines - Time-domain analysis of transmission lines, Frequency-domain analysis of transmission lines, Standing waves; Transmission line matching, Single stub matching, quarter-wave transformers.

Module – III

Waveguides - Electromagnetic fields in parallel-plate, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguides. Electromagnetic radiation, retarded potentials, power density, beam solid angle, radiation intensity, radiation resistance, radiation pattern, radiation efficiency, gain, directivity, effective aperture and effective length of the antennas.

Module – IV

Electric field, magnetic field, radiation resistance and directivity of short dipole and half wave dipole. Folded dipole, Yagi-Uda, Parabolic dish antenna. Antenna arrays – broadside and end-fire array.

Wave Propagation – Ground wave, Sky wave and Space wave propagation.

References:-


**Internal Continuous Assessment** (*Maximum Marks-50*)

- **50% - Tests (minimum 2)**
- **30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.**
- **20% - Regularity in the class**

**University Examination Pattern:**

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After the completion of this course, the students will be familiar with the fundamentals of electromagnetic theory and its area of applications.
13.607 MICROCONTROLLER & EMBEDDED SYSTEMS LAB (A)

Teaching Scheme: 2(L) - 1(T) - 0(P)  

Credits: 3

Course Objectives:

- To develop microcontroller programming skills
- To learn interfacing of various peripherals to microcontroller

List of Experiments:

Part A: Programming experiments using 8051 Trainer Kit.

1. Addition and Subtraction of 16 bit numbers.
2. Multiplication and division of 8 bit numbers.
3. Sorting, Factorial of a number.
4. Multiplication by shift and add method.
5. LCM and HCF of two 8 bit numbers
6. Matrix addition
7. Square, Square root, Fibonacci series.

Part B: Interfacing experiments

1. DAC interface.
2. Stepper motor interface.
3. Display interface.
4. Realization of Boolean expression using port.
5. Frequency measurement by counting the number of pulses in a fixed amount of time.
6. Frequency measurement by measuring the time period between two consecutive pulses.
7. Waveform generation using lookup tables.
8. PWM generation.
9. Interfacing with 8-bit ADC.

Internal Continuous Assessment (Maximum Marks-50)

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  
Maximum Total Marks: 100

Questions for each batch should be based on the list of experiments prescribed, equally from Part A and Part B.
25% - Circuit Design

15% - Implementation (Usage of Kits and trouble shooting, Coding for Software experiments)

35% - Result

25% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After the completion of this course, the students will be familiar with microcontroller programming. They will also be familiar with interfacing various peripherals to the microcontroller.
13.608 ELECTRONIC PRODUCT DESIGN & MINI PROJECT (AT)

Teaching Scheme: 1(L) - 0(T) - 3(P)  
Credits: 4

Course Objective:

- Explain the stages of product development process.
- Predict the reliability of electronic products.
- Design electronic products considering safety aspects and hazardous environment.
- Assemble electronic circuits using modern hardware after simulation the circuit.
- Construct products considering environmental safety and sustainable development.

This course includes both theory and practical works

I. THEORY

Theory classes are to be conducted 1 hour/week, based on the following syllabus:

DESIGN (Theory only)


References:


II. PRACTICAL

A) Computer Aided PCB Design & Assembling

(One hour per week is allotted for Computer Aided PCB Design & Assembling.)

Following Circuits are to be used for the above purpose (Minimum one circuit from each category should be done)

1. Discrete component circuits.
2. Timer ICs and Op-Amp ICs based circuits.
3. Digital ICs based circuits.
5. Combination of the above.
B) MINIPROJECT

For Mini project, 2 hours/week is allotted.

Each student should conceive, design, develop and realize an electronic product. The basic elements of product design - the function ergonomics and aesthetics - should be considered while conceiving and designing the product. The electronic part of the product should be an application of the analog & digital systems covered up to the 6th semester.

The realization of the product should include design and fabrication of PCB. The student should submit a soft bound report at the end of the semester. The product should be demonstrated at the time of examination.

Internal Continuous Assessment (Maximum Marks-50)
40% - An end semester written examination is to be conducted based on the Theory part (Design), with two hour duration for 20 Marks.
40% - 20 marks is to be awarded for the Mini project, after evaluation at the end of the semester including project report.
20% - 10 marks for the attendance.

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

Practical examination will be conducted for Computer Aided PCB Design & PCB Assembling based on the work done in the class. The mini project will also be evaluated during the practical examination.

The following guidelines should be followed regarding award of marks

15% - PCB Design (any given circuit using CAD software) -
20% - PCB assembling of the given circuit on a single sided given PCB -
15% - Result/working of the assembled circuit -
25% - Evaluation of the finished Mini project done by the student -
25% - Viva voce (Based only on the Mini Project done by the student) -

Candidate shall submit the certified fair record and the mini project report (Soft bounded) for endorsement by the external examiner.

Course Outcome:

At the end of the course, the student shall be able to

- Identify and decide the stages of product development process.
- Design and construct reliable electronic products considering safety aspects.
- Assemble electronic circuits using modern hardware after simulation the circuit.