UNIVERSITY OF KERALA

MSc DEGREE PROGRAMME

IN

ELECTRONICS

REVISED REGULATIONS, SCHEME & SYLLABUS

2019
1. Eligibility
The eligibility for admission to MSc Electronics degree course in affiliated institutions under Kerala University is a BSc Degree in Electronics/Physics/Computer Science/BCA with not less than 50% marks in optional subjects or 2.0 CGPA (s) out of 4.0 or 5.0 CCPA(s) out of 10.0 subject to the usual concessions allowed for backward classes and other communities as specified from time to time.

2. Admission
The admission to the MSc degree course shall be as per the rules and regulations of the University. Students admitted under this programme are governed by the Regulations in force.

3. Programme structure and duration
The duration of the programme shall be 4 semesters. The duration of each semester will be 70 working days. A candidate who could not complete and pass all examinations within four (4) years since his first admission to MSc programme will not be allowed to continue and he/she has to quit the programme. The programme shall include two types of courses. Core courses and Elective courses. There will be five core courses and two practical courses in first semester. In the second semester there will be three core courses, one elective course and two practical course. In the third semester there will be three core course, one elective course, one practical course and one mini project. In the forth semester there will be one core courses, one elective course, a seminar and main project. At the end of the programme there will be a comprehensive viva-voce which covers questions from all courses in the programme.

4. Evaluation
Candidates in each semester will be evaluated by continuous evaluation and end semester University examination. The individual maximum marks allotted for continuous assessment and University examination for each subject is as prescribed by the scheme of study.

5. Sessional Marks
There will be continuous evaluation (CE) based on continuous assessment for each course and carries 25% weightage as shown below: The faculty member concerned will do the continuous assessment for each semester.

(a) Theory

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>5</td>
</tr>
<tr>
<td>Assignment</td>
<td>7.5 (minimum 2)</td>
</tr>
<tr>
<td>Class tests</td>
<td>12.5 (minimum two tests)</td>
</tr>
</tbody>
</table>

*Class tests*: For each course there shall be a minimum of two written tests during a semester.

*Assignments*: Each student is required to submit two assignments for a theory course.

(b) Practical

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>5</td>
</tr>
<tr>
<td>Performance</td>
<td>5</td>
</tr>
<tr>
<td>Laboratory record</td>
<td>5</td>
</tr>
<tr>
<td>Test</td>
<td>5</td>
</tr>
</tbody>
</table>
Separaterecordsaretoobeusedforeachpracticalcourse.Acandidateshallbepermittedto attend the end semester practical examination only if he/she submits a duly certified record book. This is to be endorsed by the external examiner.

6. END SEMESTEREXAMINATION for theory papers

There will end semester examination (ESE) conducted by the University for each course and carries 75% weightage. The question paper consists of two parts
Part A (27 marks). Nine compulsory questions of 3 marks each
Part B (48 marks). Students must answer two out of three questions from each module. Each question carries 8 marks.

7. Pass Requirements
For each subject (including the practical), a student should get a minimum of 40% marks for the university examination and 50% aggregate for the sessional and university examination together for subjects in the 1st, 2nd, 3rd semesters. For the seminar and project in the 4th semester each student should a minimum of 50% for the sessional. For the viva-voce examination in the 4th semester, each student should get a minimum of 50% aggregate for the university examination.
## I. GENERAL STRUCTURE FOR MSc. ELECTRONICS – 2019 Scheme

### Semester 1

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Subject Name</th>
<th>End Semester Exam. Hrs.</th>
<th>Instructional Hrs/week</th>
<th>Marks for CE</th>
<th>Marks for ESE</th>
<th>Total Marks</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L P</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>PGE 101T</td>
<td>Advanced Mathematics</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>PGE 102T</td>
<td>Solid State Electronics</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>PGE 103T</td>
<td>Mixed Circuit Design</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>PGE 104T</td>
<td>Communication Systems</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>PGE 105T</td>
<td>Programming in C++ and Data Structures</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>PGE 106P</td>
<td>Integrated Circuits Lab</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>PGE 107P</td>
<td>Programming in C++ Lab</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>25</td>
<td>75</td>
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<tr>
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<td>8</td>
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<td>Sub Code</td>
<td>Subject Name</td>
<td>End Semester Exam.Hrs.</td>
<td>Instructional Hrs/week</td>
<td>Marks for CE</td>
<td>Marks for ESE</td>
<td>Total Marks</td>
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<tr>
<td>PGE 201 T</td>
<td>Digital Systems Design with VHDL</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>PGE 202 T</td>
<td>Microprocessor and Microcontroller</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>PGE 203 T</td>
<td>Control systems</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>PGE 204 T</td>
<td>Elective I</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>PGE 205 P</td>
<td>Microprocessor and Microcontroller Lab</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>PGE 206 P</td>
<td>Communication Engineering Lab</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>17</strong></td>
<td><strong>0</strong></td>
<td><strong>8</strong></td>
<td><strong>150</strong></td>
<td><strong>450</strong></td>
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</table>

Semester II
## SEMESTER III

<table>
<thead>
<tr>
<th>Sub Code</th>
<th>Subject Name</th>
<th>End Semester Exam.Hrs.</th>
<th>Instructional Hrs/week</th>
<th>Marks for CE</th>
<th>Marks for ESE</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGE 301 T</td>
<td>Embedded Systems</td>
<td>L:3 P:4</td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
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<tr>
<td>PGE 302 T</td>
<td>Digital Image Processing</td>
<td>L:3 P:4</td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>PGE 303 T</td>
<td>RF and Microwave Technologies</td>
<td>L:3 P:5</td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>PGE 304 T</td>
<td>Elective II</td>
<td>L:3 P:4</td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>PGE 305 P</td>
<td>Computer Aided Design</td>
<td>L:3 P:0</td>
<td>4</td>
<td>25</td>
<td>75</td>
<td>100</td>
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<tr>
<td>PGE 306 P</td>
<td>Mini Project</td>
<td>L:3 P:0</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>100</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td>17 L:0 P:8</td>
<td>175</td>
<td>425</td>
<td>600</td>
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## Semester IV

<table>
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<tr>
<th>Sub Code</th>
<th>Subject Name</th>
<th>End Semester Hrs/week</th>
<th>Instructional Hrs/week</th>
<th>Marks for CE</th>
<th>Marks for ESE</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGE 401 T</td>
<td>IOT and Python Programming</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>75</td>
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<tr>
<td>PGE 402 T</td>
<td>Elective III</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>25</td>
<td>75</td>
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<tr>
<td>PGE 403 P</td>
<td>Seminar</td>
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<td>50</td>
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<tr>
<td>PGE 404 P</td>
<td>Project</td>
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<td>250</td>
<td>0</td>
<td>0</td>
<td>250</td>
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<tr>
<td>PGE 405 P</td>
<td>Viva Voce</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>0</strong></td>
<td><strong>17</strong></td>
<td><strong>350</strong></td>
<td><strong>250</strong></td>
<td><strong>600</strong></td>
</tr>
</tbody>
</table>

### Elective I:
1. Advanced Wireless Communication
2. Digital & Data Communication
3. Fuzzy Systems and Applications

### Elective II:
1. Robotics
2. Information Theory & Coding
3. Satellite and Optical Communication

### Elective III
1. Biomedical Electronics
2. Machine Learning
PGE 101 T ADVANCED MATHEMATICS

MODULE I

Descriptive Statistics-Treatment of data: Descriptive measures - Measures of central tendency-measures of Dispersion-Moments-Coefficient of Skewness, Kurtosis

Probability Distribution: Axioms of Probability, Random variable -Bernoulli’s, Binomial Poisson Distributions-Normal distributions

MODULE II


MODULE III


References:

Module I
Quantum Mechanics-Wave nature of particles-uncertainty Principle-Wave motion- Superposition Principle-De-Broglie Hypothesis-Time dependent and independent Schrodinger wave Equation-Planck’s concept of energy & Quantization particle in one dimensional infinite potential well-Finite and infinite square well-Particle in Box-Square potential –Barrier and quantum mechanical Tunneling. Structure of Solids and Crystal Theory – Lattice, Basis and Unit Cells, Important Structures, X-Ray and Neutron Crystallography and the Reciprocal Lattice.

Module II

Module III
Introduction to nanotechnology and nano electronics, Impacts, Limitation of conventional microelectronics. Introduction to methods of fabrication of nonmaterial –different approaches. Fabrication of nano-layers- Physical Vapor Deposition, Chemical Vapor Deposition, Epitaxy, Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide. Fabrication of nano particles-ball milling, laser ablation (PLD), sol gel, self-assembly, preparation of quantum dots (qualitative treatment only)

Text Book
2. V.SureshBabu:Solid state devices& technology, (Sanguine technical publishers)Module II

References
2. M STyagi:Introduction to semiconductor materials and devices (Wiley India)

Question Paper
The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48marks). Students must answer two out of three questions from each module. Each question carries 8 marks. (Minimum 60% problems, derivation and proof)
PGE103TMIXEDCIRCUITDESIGN

Module I
Linear op amp circuits: Inverting and noninverting amplifier, Summing amplifier, Integrator, Differentiator, Differential amplifier, Instrumentation amplifier, Precision rectifiers, Oscillators, Phase-shift, Wein-bridge, multivibrators – Astable, Monostable, Schmitt Trigger. Biquadratic filter of low pass, high pass, band pass and band elimination filters, switched capacitor resistor, Switched capacitor filter

Module II
MOS Technology, MOSFET Device physics, VI characteristics, Long channel MOSFET, Short channel effect of MOSFET, switching characteristics, Pass transistors and transmission gate logic, Differential amplifiers- CMRR – CMOS Op Amp- Frequency Compensation of op amps, Analog Multipliers

Module III
Sample and hold circuits, CMOS VCO, Charge pump PLL, PFD, ADCs and DACs, Charge Scaling DAC, Pipeline ADC, Cyclic ADC, Charge distribution ADC.

References:
1. Sergio Franco, Design with Amplifiers and Analog Integrated Circuits, TMH, 3ed

Question Paper
The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 marks). Students must answer two not of three questions from each module, Each question carries 8 marks

(Minimum 60% problems, derivation and proof)
PGE 104T Communication Systems

Module I
Overview of communication system, Bandwidth, Modulation, Need for modulation, Analog modulation types.
Angle modulation: Types, Frequency Modulation, Sinusoidal FM, Frequency spectrum for sinusoidal FM,
Average power in sinusoidal FM. Non sinusoidal Modulation: Deviation ratio.
Phase modulation, Equivalence between FM and PM, Sinusoidal PM, Digital PM.
Angle modulator circuits: Varactor diode modulator, Transistor modulator.
FM transmitters, FM Broadcast.
AFC, Amplitude limiters, Noise in FM system, Pre- emphasis and De- emphasis, FM broadcast receivers, FM stereo receiver.

Module II
Introduction to modern wireless system: cellular concept, Frequency reuse, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular system, Principle of GSM and CDMA. Fading and Multipath channels and their parameters.

Module III
Orthogonal Frequency Division Multiplexing: Basics, Orthogonality, Frequency Domain Orthogonality, Performance of OFDM with various modulation schemes, Reduction of ISI, The OFDM Transmitter, Initial Block diagram, OFDMA in mobile cellular network, Single Carrier FDMA.

Textbooks:
1. Electronics communications, Dennis Roddy and John coolen, 4e, Eastern Economy Edition, Prentice hall of India (I module)
2. Micro wave and radar Engineering, Dr. Kulkarni, 4e, Umesh (II module)
4. AN INTRODUCTION TO LTE, LTE-ADVANCED, SAE AND 4G MOBILE COMMUNICATIONS, Christopher Cox, John Wiley & Sons, Ltd., Publication (III module)
PGE 105T  PROGRAMMING IN C++ AND DATA STRUCTURES

Module I
Classes- Objects, access modifiers, arrays, pointer to arrays, constants, reference, dynamic memory allocation using new & delete operation, friend function, constructors, function overloading, operator overloading-unary, binary, inheritance, polymorphism, virtual function, files and streams.

Module II

Module III

Text book
2. D Samanta-Classic Data Structures-PHI

Reference
1. Balaguruswami-Programming in C++-Shaunm’s series
2. Richard F Gilburg, B A Frouzan: Data Structures: A pseudocode Approach with C++
3. 
4. Robert Kruse et al: Data Structures and program design in C-PHI.2nd Edition

Question Paper
The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48marks). Students must answer two out of three questions from each module. Each question carries 8 marks. (Minimum 40% program)
1. To study Differential amplifier using op-amp
2. To study Schmitt trigger using op-amp
3. To study comparator using op-amp
4. To study window detector using op-amp LM311
5. To study precision rectifier using op-amp
6. To study triangular and square wave generators using op-amp
7. To study I to V and V to I converter using op-amp
8. To study Wein bridge oscillator using op-amp with amplitude stabilization
9. To study the instrumentation amplifier using op-amp
10. To study counter ramp ADC and R-2R ladder DAC
11. To study 723 voltage regulator with short circuit and fold back protection
12. To study BCD adder using 7483 IC
13. To study the master slave J-K flip flop and verify the truth table
14. To study Johnson counter using CD 4017
15. To study Mod 10 counter using IC 7490 and verify the truth table
16. To study Multiplexer IC 74150 and De-multiplexer IC 74154
17. To setup a 7 segment LED display using BCD counter decoder IC
18. To study ADC 0808 and DAC 0800

**Note:** Students have to perform at least 15 experiments from the above list

**Note:** For University examination the following guidelines should be followed regarding the award of marks

(a) Circuit and design : 15 Marks
(b) Performance (Wiring, usage of equipment and troubleshooting) : 15 Marks
(c) Result : 20 Marks
(d) Viva-voce : 20 Marks
(e) Record : 5 Marks
19. Program to find the factorial of a given number
20. Program to find the number of vowels from a given line
21. Program to find Transpose of a Matrix
22. Program to find whether the given string is palindrome or not
23. Program to find the occurrence of a number in an array
24. Write a program to create a file and copy the content to another file
25. Program to find the volume of a sphere, Cylinder and Cone using overloading
26. Program to implement different string handling function
27. Pascal triangle
28. Matrix multiplication
29. Decimal to binary conversion
30. String operation
31. File operation
32. Array insertion and Array deletion
33. Linear and Binary search
34. Evaluation of postfix operation
35. Bubble, Merge and Insertion sort
36. Stack implementation using array
37. Stack implementation using linked list
38. Queue implementation using array

Note: Students have to perform at least 17 experiments from the above list

Note: For University examination the following guidelines should be followed regarding the award of marks

(f) Algorithm/flow chart : 10 Marks
(g) Program : 20 Marks
(h) Result : 20 Marks
(i) Viva-voce : 20 Marks
(j) Record : 5 Marks
PGE 201T DIGITAL SYSTEMS DESIGN WITH VHDL

Module I


Module II

Type declaration and usage, Enumeration type for multi value logic, Array declaration, VHDL Operators, subprogram parameters, Types and overloading, Array attributes, Type attributes, Signal attributes, Entity attributes. Sequential processing - Process statement, Signal assignment versus Variable assignment, Sequential statements - IF, CASE, LOOP, ASSERT, WAIT etc., Concurrent assignment problem, Passive processes. Structural Specification of Hardware - Inverter model, NANO gate model.

Module III


References:

Question Paper The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 marks). Students must answer two out of three questions from each module. Each question carries 8 marks. (Minimum 50% problems, design and program)
PGE 202T MICROPROCESSOR AND MICROCONTROLLER

Module I

Introduction to microprocessor, CISC and RISC, architecture of 8086 microprocessor, clock and reset signal generation, pin functions of 8086, system bus timing, Addressing modes, Instructions and programming, Assembler directives, Subroutine and macro, Interrupts and their processing, Maximum and minimum modes, Memory interfacing, I/O interfacing.

Module II


Module III

Interfacing with 8086 - keyboard, display and ADC interface using 8255, Peripheral interface using 8259 interrupt controller, 8088 coprocessor and its interface with 8086. 8051· interfacing - keyboard, ADC, DAC, and LCD module interface. Applications - square wave and rectangular wave generation, frequency counter and temperature measurement.

References:

1. Douglas V. Hall : Microprocessors and Interfacing, TMH, New Hill
PGE 203T CONTROL SYSTEMS

Module I

Basic Elements of Control Systems - Open loop and Closed loop systems - examples - Concept of feedback - Transfer function, modelling of electrical, translational and rotational mechanical systems - Block diagram reduction techniques - Signal flow graph- Mason's gain formula - Standard test signals, natural frequency and damping ratio. - Definitions of poles, zeros, order and type.

Module II

Analysis of continuous time systems - time domain solution of first order systems - time constant - time domain solution of second order systems - determination of response for standard inputs using transfer functions - steady state error - P - PI - and PID compensation. Concept of Stability: absolute, relative and marginal, nature of system response - Routh Hurwitz techniques - Root locus techniques: Basic properties of Root Loci- Construction of Root Loci and analysis of control system.

Module III


References:


Question Paper The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 marks). Students must answer two out of three questions from each module. Each question carries 8 marks.
PGE 204.1T ADVANCED WIRELESS COMMUNICATION SYSTEMS

Module I

Essential functions of SDR, Hardware Architecture, Software Architecture, SDR Development and Design.

Module II

Multiple Antenna Techniques, Architecture of the LTE Air Interface, Cell Acquisition, Data Transmission and Reception, Random Access, Air Interface Layer2, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture, The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design,
Implementing SDR using lab-view and USRP.

Module III


Textbooks:

Module I

Module II

Module III

References:
PGE 204.3T FUZZY SYSTEMS AND APPLICATIONS

Module I


Module II


Module III

Approximate reasoning or fuzzy inference, generalized modus ponens (GMP), generalized diagram of fuzzy logic controllers, Multi input multi output control system. Automatic train operating system.

References:

Programs to be done in the kit

39. Addition / subtraction of 32-bit numbers
40. 16-bit multiplication
41. Prime number generation
42. Fibonacci series
43. Bubble sorting
44. Square root of 16-bit number
45. Comparison of string
46. Division of 32-bit numbers
47. Find a character from an array

Note: Students have to perform at least 6 experiments from the above list

Microcontroller experiments (8081)
1. Sum of series of 8-bit binary/BCD numbers
2. 8-bit multiplication and division
3. Decimal to Hex and Hex to Decimal conversion
4. LCM and HCF of two 8-bit numbers
5. Sorting

Note: Students have to perform all experiments from the above list

Interfacing using 8086 and 8051 kit
1. Stepper motor interfacing
2. Waveform generation using DAC
3. ASCII character reading from keyboard
4. ADC interfacing

Note: Students have to perform all experiments from the above list

Note: For University examination the following guidelines should be followed regarding the award of marks

(k) Algorithm/flow chart : 10 Marks
(l) Program : 20 Marks
(m) Result : 20 Marks
(n) Viva-voce : 20 Marks
(o) Record : 5 Marks
48. AM generation using discrete components
49. AM generation using envelope detector
50. AM detection using envelope detector
51. IF tuned amplifier
52. FM using 555 IC
53. Study of 565 PLL – measurement of lock range and capture range
54. FM generation and demodulation using 565
55. Frequency multiplier using 565
56. PAM modulator and demodulator
57. PWM generation and demodulation using 555 IC
58. PPM generation and demodulation using 555 IC
59. Pseudo Random Binary Sequence generator
60. Delta modulation and demodulation
61. ASK modulation and demodulation
62. FSK modulation and demodulation
63. Digital pulse detector
64. TDM generation
65. BPSK modulation and demodulation

Note: Students have to perform at least 15 experiments from the above list

Note: For University examination the following guidelines should be followed regarding the award of marks

(p) Circuit and design : 15 Marks
(q) Performance (Wiring, usage of equipment and troubleshooting) : 15 Marks
(r) Result : 20 Marks
(s) Viva-voce : 20 Marks
(t) Record : 5 Marks
PGE 301T: EMBEDDED SYSTEMS

Module - I
Introduction to Embedded Systems- Processor Embedded into a system, Hardware units and devices, embedded software. Processor and Memory Organization Structural Units in a Processor, Processor selection for an Embedded system. Memory devices, Memory selection for an Embedded system. Allocation of Memory in Program Cache and Memory management links. Interfacing Processors, Memories and Input Output devices introduction to RTOS Industrial and control applications of embedded systems. introduction to development and testing tools.

Module - II

Module -III
Arm Design philosophy – Embedded system hardware, Arm processor fundamentals- Register, CPSR, pipeline, Instruction set Overview - data processing, branch, load-store, interrupt and program status register instructions. Exceptions & interrupts: handling & priorities.

References:
4. Microchip - Microcontroller application notes / data sheets

Question paper
The question paper consists of two parts, Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 Marks) Students must answer two out of three questions form each module. Each question carries 8 marks.
PGE 302T DIGITAL IMAGE PROCESSING

Module I

Module II

Module – III

References:

Question paper
The question paper consists of two parts, Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 Marks) Students must answer two out of three questions form each module. Each question carries 8 marks.(Minimum 40 % problem and proof)
PGE 303TRF AND MICROWAVE TECHNOLOGIES

MODULE I
Maxwell’s equations, wave equations, Propagation of waves in Rectangular Waveguide, TEM, TE, TM, HE wave definitions, TE and TM modes, TE and TM modes in rectangular waveguide, Poynting vector, Propagation of uniform plane waves in lossy media, conductors and dielectrics, phase velocity and group velocity.

Transmission lines: Types of transmission lines, Two wire parallel transmission lines, Voltage and Current relationship on a transmission line, Characteristics Impedance, Reflection coefficient, Input Impedance, VSWR, Impedance at a voltage minimum and at a voltage maximum, Losses due to mismatch in transmission lines, Impedance matching, Microstrip transmission line, Types of Microstriplines, Smith Chart.

MODULE II
Microwave devices: Limitations of conventional tubes at microwave frequencies, Basic principles of operation of two cavity Klystron amplifier, multicavity Klystron, two cavity Klystron oscillator and Reflex Klystrons, Principles of operation of Magnetron and Travelling Wave Tube, Solid State Microwave Devices- Basic theory of Gunn diode and PIN diode. Microwave components: T junctions-H plane, E plane, E-H plane and Magic T, Circulator and Isolator, Directional couplers.

MODULE III
Radiation and antennas: Antenna structures, Antenna parameters- Gain, directivity, aperture, radiation pattern, types of antennas-Yagi-Uda, Rhombic, Horn, Helical and Loop, Antenna arrays-broadside and end fire array.

TEXT BOOKS:
2. K. C. Gupta, Microwaves, New Age International Ltd. 1995
3. Rajeswary Chattergee: Microwave, Millimeter wave and sub-millimetre wave vacuum electron devices, Affiliated East-west Press, 1994

References:
PGE 304.1T ROBOTICS

Module I


Module II

Robot hardware: Robot sensors and proximity sensor - range sensor - visual sensor - Auditory sensor - Touch and Slip sensor - Force and Torque sensors.
Grippers: Different types.

Module III

Robot motion control: Robot motion planning - path planning - Geometric path, Obstacle avoidance - Shortest path, Trajectory planning - Boundary conditions - Control methods - Convention joint PID control - Computed torque - Non-linear feedback - Adaptive control, Variable structure control.

References:

3. Robotics - control, sensing, vision and intelligence - Fu, Gonzalez and Lee - McGraw Hill
Module I


Module II

Definitions and principles: Hamming weight, Hamming distance, Minimum distance decoding – Single parity codes, Hamming codes, Repetition codes – Linear block codes, Cyclic codes- Syndrome calculation, Encoder and decoder - CRC

Module III


References:
1. Dr.P.SSathya Narayana: Concepts of Information Theory & Coding, Dynaram Publications

Question Paper
The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 marks). Students must answer two out of three questions from each module. Each question carries 8 marks. (Minimum 50% problems, derivation and proof)
Module I


Module II

Optical transmission system concepts, optical networking, transmitting light on a fiber, light propagation in multimode fibers single mode fiber properties and characteristics, plastic optical fiber.

Module III

Optical sources and detectors: light production, LEDs, characteristics, lasers, DFB, lasers, photoconductors and photodiodes.
Optical Communication System, point to point transmission systems, modulation, transmission system limits and characteristics, optical systems engineering, control of dispersion in SM and MM fiber links, Solitons, dark solitons and spatial solitons.

References:


Question Paper

The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. Part B (48 marks). Students must answer two out of three questions from each module. Each question carries 8 marks. (Minimum 30% problems, derivation and proof)
MATLAB & SIMULINK

1. Writing M files for creation of analog and discrete signals, plotting of signals etc.
2. Writing simple programs using MATLAB for handling arrays, files, plotting of functions and generate patterns using mesh plot, waterfall plot etc.
3. Reading an image, convert the image using colour maps, plotting histograms of the image.
4. Edge detection, Gradient calculation of an image
5. Removal of Salt & Pepper noise.
6. Perform contrast stretching on an image.
7. FIR filter design using windowing method.
11. Fourier analysis using Simulink.

VHDL

1. Implementation of logic gates.
2. Implementation of Half adder and Full adder.
4. Implementation of generic comparator.
5. Construction of 8-bit synchronous counter using subprograms.
6. Design and simulate a digital circuit that can extract data from serial bits by removing start and stop bits.

Note: Students have to perform at least 15 experiments from the above list

Note: For University examination the following guidelines should be followed regarding the award of marks

(u) Algorithm/flow chart : 10 Marks
(v) Program : 20 Marks
(w) Result : 20 Marks
(x) Viva-voce : 20 Marks
(y) Record : 5 Marks
PGE 306P MINIPROJECT

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 analog and digital systems covered so far. The realization of the product should include design and fabrication of PCB. Study of PCB design (single sided and double sided) may use any available software. The student should submit the report at the end of the semester. The product should be demonstrated at the time of examination.

Note: For the project evaluation, the following guidelines should be followed for awarding of marks

(a) Demonstration :15 Marks
(b) Completeness and Novelty :15 Marks
(c) Viva-Voce :20 Marks
PGE 401T: INTERNET OF THINGS and PYTHON PROGRAMMING.

Module I

Module III

Module III

Texts book
1. Designing the Internet of Things -- Adrian McEwen, Hakim Cassimally,( Wiley)
2. Internet of Things Principles and Paradigms -RajkumarBuyya ,AmirVahidDastjerdi, MK
3. Learning Python -- Mark Lutz, O'Reilly.
PGE 402.1 T BIOMEDICAL ELECTRONICS

MODULE I


MODULE II


MODULE III


References:

5. Leslie Cromwell, Fred J. Weibell and Erich A. Pferffer: Biomedical

Question Paper

The question paper consists of two parts. Part A covering the entire syllabus for 27 marks. This shall contain nine compulsory questions of 3 marks each. PARTB (48 marks). Students must answer two out of three questions from each module. Each question carries 8 marks.
PGE 402.2T: MACHINE LEARNING

Module I

Module II
Learning with Trees-Decision Trees- Constructing Decision Trees, Classification and Regression Trees, Tree construction, Issues in Decision Tree Learning-Avoiding Over-fitting, Reduced Error Pruning, the problem of Missing Attributes, Gain Ratio, Classification by Regression (CART), Ensemble Learning. – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithm, Hierarchical Clustering Methods, Density based clustering

Module III

Text book
**PGE 403P SEMINAR**

**Internal Evaluation (50 Marks)** The student is expected to present a seminar on one of the current topics in electronics, communication and its allied research areas. The student will undertake a detailed study on the chosen topic and must submit a report at the end of the semester. The evaluation will be done by an internal examiner appointed by the head of the institution. Maximum time for presentation and question answer session is limited to 1 hr.

**Note:** The distribution of marks for seminar is given below

- **Presentation:** 25 marks
- **Report:** 20 marks
- **Attendance:** 5 marks

**PGE 404P PROJECT**

**Internal Evaluation (250 Marks)** The student is expected to prepare a report on the project work done by him/her and present a paper highlighting the work done by him/her in a seminar. The student is expected to complete project work assigned to him/her and submit the project report at the end of the semester. This report shall be a hard bound type. Marks shall be awarded by continuous evaluation of minimum two times in this semester. Valuation of report, results, presentation and viva will be conducted by a committee consisting of the guide, project coordinator and Head of the Department. The project is individual and not a group project.

**Note:** The distribution of marks for the project is given below

- **Presentation:** 50 marks
- **Report:** 75 marks
- **Viva:** 50 marks
- **Results/ product:** 75 marks

**PGE 405 VIVA - VOCE**

There will be a comprehensive viva voce examination for each student at the end of forth semester. The oral examination will be based on the project work, seminar report and other subjects studied during the course. Students shall submit the project report and seminar report for the viva voce examination. Marks for project shall have weightage for valid results only. The marks distribution for viva voce examination is given below

- **General Topics:** 50 marks
- **Project:** 35 marks
- **Seminar:** 15 marks