# ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
## Guwahati

## Course Structure and Syllabus

## (From Academic Session 2018-19 onwards)

# B.TECH

## ELECTRONICS AND COMMUNICATION ENGINEERING/ ELECTRONICS AND TELECOMMUNICATION ENGINEERING

## 5th SEMESTER

**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY**
**Guwahati**
**Course Structure**

**(From Academic Session 2018-19 onwards)**
**B.Tech 5th Semester: Electronics and Communication/Telecommunication Engineering**

**Semester V/ B.TECH/ECE/ETE**

| Sl. No. | Sub-Code | Subject | Hours per Week | | | Credit | Marks | |
|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | C | CE | ESE |
| **Theory** | | | | | | | | |
| 1 | ECE181501 | Microprocessor and Embedded System | 3 | 0 | 0 | 3 | 30 | 70 |
| 2 | ECE181502 | Data Structure and Algorithm | 3 | 0 | 0 | 3 | 30 | 70 |
| 3 | ECE181503 | Digital Communication | 3 | 0 | 0 | 3 | 30 | 70 |
| 4 | ECE181504 | Control Systems | 3 | 0 | 2 | 4 | 30 | 70 |
| 5 | ECE181505 | Computer Networks | 3 | 0 | 0 | 3 | 30 | 70 |
| 6 | HS181506 | Engineering Economics | 3 | 0 | 0 | 3 | 30 | 70 |
| **Practical** | | | | | | | | |
| 1 | ECE181511 | Microprocessor and Embedded System Lab | 0 | 0 | 2 | 1 | 15 | 35 |
| 2 | ECE181512 | Data Structure and Algorithm Lab | 0 | 0 | 2 | 1 | 15 | 35 |
| 3 | ECE181513 | Digital Communication Lab | 0 | 0 | 2 | 1 | 15 | 35 |
| 4 | SI181521 | Internship-II (SAI – Academia) | 0 | 0 | 0 | 1 | - | 100 |
| **TOTAL** | | | 18 | 0 | 8 | **23** | **225** | **625** |
| Total Contact Hours per week: 26 | | | | | | | | |
| **Total Credits: 23** | | | | | | | | |

## Detailed Syllabus:

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| **ECE181501** | **Microprocessor and Embedded System** | **3-0-0** | **3** |

**Course Outcomes:**
At the end of this course students will be able to
**CO1:** Explain the architecture of 8085 Microprocessor and some advanced processors.
**CO2:** Apply assembly language for programming of 8085 Microprocessor.
**CO3:** Describe the architecture of 8051 and ARM Microcontrollers.
**CO4:** Make use of Assembly language and Embedded C for programming 8051 microcontroller.
**CO5:** Design suitable interfacing of peripherals with 8085 microprocessor and 8051microcontroller.

**MODULE 1: Architecture of Microprocessors (5 Lectures)**
General processor architecture, 8085 architectures, Memory classification and interfacing, Memory – map, Address decoding (Absolute and partial); Pin diagram of 8085, interfacing of I/O devices, peripheral I/O and memory mapped I/O.

**MODULE 2: Programming of 8085 (10 Lectures)**
8085 instruction format and classification, addressing modes; Assembly language programming of 8085, hand assembly of a program. Program looping, counter, subroutine & linkages, delay routine. Instruction cycle, Machine cycle and T–state, Bus Timing diagram. Stack and subroutine, stack used by the microprocessor during CALL and RET instructions, stack used by the programmer, 8085 interrupt process, software and hardware interrupts, their priorities, concepts of Direct Memory Access.

**MODULE 3: Interfacing with 8085 (6 Lectures)**
Study of Programmable Interfacing devices like 8255, 8254, 8257, 8279 and their applications. Interfacing of LED and switches, matrix keyboard and multiplexed displays.

**MODULE 4: Advanced Processor (5 Lectures)**
Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium

**MODULE 5: Architecture of Microcontrollers (4 Lectures)**
Overview of the architecture of 8051 microcontrollers, ARM microcontroller. RISC vs. CISC architecture. Addressing modes of 8051 and ARM 9 Microcontroller, Interrupt, Counter and Timer.

**MODULE 6: Programming and Interfacing with 8051 and ARM microcontroller (10 Lectures)**
Programming with Assembly and Embedded C.Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters, 7 segment LEDs, LCDs, etc.

**Textbooks/Reference Books:**

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications withthe 8085/8080A, Penram International Publishing, 1996
2. Mazidi & McKinlay," The 8051 Microcontroller and Embedded Systems using Assembly and C", PHI.
3. D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.
4. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| ECE181502 | Data Structure and Algorithm | 3-0-0 | 3 |

**Course Outcome:** At the end of this course students will be able to

**CO1:** Design algorithms and apply asymptotic notations to analyze the performance of algorithms.
**CO2:** Apply linear data structures like arrays, linked list, stacks and queues to solve problems.
**CO3:** Illustrate and compare various techniques for sorting and searching.
**CO4:** Apply nonlinear data structures like trees and graphs to solve problems.
**CO5:** Apply various hashing techniques to solve problems and describe file-organization and indexing.

**MODULE 1: Introduction to Algorithms** **(5 Lectures)**
Introduction to Algorithms, Time and Space Complexity, Asymptotic Notations, Asymptotic analysis of simple algorithms, Recursive and Iterative algorithms, Types of Recursion, Order Statistics

**MODULE 2: Linear Data Structure** **(10 Lectures)**
Data Structures, Types of Data structures,1-D Arrays and multi-dimensional arrays, Strings, Pointers and Arrays. Stacks and Applications of Stacks, Queues and its Applications, Dequeues, Link List, Circular Link List and Double Link Lists, Applications of Linked lists

**MODULE 3: Sorting and Searching** **(7 Lectures)**
Sorting, Internal and external sorting, Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Heap Sort, Radix Sort, Bucket Sort, Searching, Linear Search, Binary Search

**MODULE 4: Non-Linear Data Structure** **(10 Lectures)**
Trees, Different types and Applications of trees, Tree Traversals, Binary trees, threaded trees, Binary Search Trees, Height balanced and weight balanced trees, AVL trees, Huffman tree, B-trees, B+ trees. Graphs and Representations, BFS, DFS, Minimum Spanning Trees, Prim's and Kruskal's Algorithms, Applications of graphs

**MODULE 5: Hashing and File Organization** **(8 Lectures)**
Hashing and Hash Tables, Hash functions, properties and types of hash functions, collision and collision resolution techniques, Applications of hashing, File Organization, Sequential, relative and indexed sequential organization, different types of indexes

**Textbooks/Reference Books:**


1. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning.
2. Horwitz E., S. Sahni and S. Anderson, Fundamentals of Data Structures in C, University Press (India).
3. Aho A. V., J. E. Hopcroft and J. D. Ullman, Data Structures and Algorithms, Pearson Publication.
4. Tremblay J. P. and P. G. Sorenson, Introduction to Data Structures with Applications, Tata McGraw Hill.
5. Peter Brass, Advanced Data Structures, Cambridge University Press.
6. Lipschuts S., Theory and Problems of Data Structures, Schaum's Series.
7. Wirth N., Algorithms + Data Structures = Programs, Prentice Hall.
8. Hugges J. K. and J. I. Michtm, A Structured Approach to Programming, PHI.
9. Martin Barrett, Clifford Wagner, And Unix: Tools for Software Design, John Wiley.
10. Samanta D., Classic Data Structures, Prentice Hall India.
11. CLR must be the text book of this course

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| **ECE181503** | **Digital Communication** | **3-0-0** | **3** |

**Course Outcomes:**
At the end of this course students will be able to
**CO1:** Explain pulse modulation techniques.
**CO2:** Apply signal space representation leading to optimum detection.
**CO3:** Analyse baseband pulse transmission.
**CO4:** Analyze different digital modulation schemes and compute the bit error performance.
**CO5:** Describe the concept of information theory and apply coding techniques.

**MODULE 1: Pulse Modulation Techniques** **(6 Lectures)**
Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Noise considerations in PCM, Time Division multiplexing, Delta modulation, Differential pulse code modulation.

**MODULE 2: Signal Space Analysis** **(8 Lectures)**
Basics of Gaussian random variables, vectors and processes, Basics of hypothesis testing, Geometric representation of signal waveforms: Gram-Schmidt procedure for baseband and bandpass signal representation, Optimum detection in AWGN channel: maximum likelihood decoding, correlation receiver, Error probability for the AWGN channel.

**MODULE 3: Baseband Pulse Transmission** **(7 Lectures)**
Matched filter receiver, inter symbol interference (ISI), Nyquists's criterion for distortion-less baseband binary transmission, Nyquist and raised Cosine pulses, baseband M-Ary PAM transmission.

**MODULE 4: Passband Digital Transmission** **(8 Lectures)**
Passband transmission model. Coherent phase shift keying (PSK) and coherent frequency shift keying (FSK), M-Ary Phase Shift Keying (MPSK), Differential PSK, Bandwidth consideration and probability of error calculation for these schemes.

**MODULE 5: Information Theory** **(6 Lectures)**
Uncertainty, information and entropy, source-coding theorem, Discrete memoryless channel, mutual information, channel capacity, channel-coding theorem, some capacity computations: binary symmetric channel capacity, AWGN channel capacity

**MODULE 6: Error Coding** **(5 Lectures)**
Linear block codes, convolutional codes, Viterbi Algorithm for maximum likelihood decoding for convolutional codes.

**Textbooks/Reference Books:**


1. Madhow, U., " Fundamentals of Digital Communication", Cambridge University Press, 2009.
2. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
3. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education,2002.
4. Taub H. and Schilling D.L., "Principles of Communication Systems”, Tata McGraw Hill,2001.
5. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",JohnWiley, 1965.
6. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", KluwerAcademic Publishers, 2004.
7. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

| Course Code | Course Title | Hours per week L-T-P | Credit |
|---|---|---|---|
| **ECE181504** | **Control Systems** | **3-0-2** | **4** |

**Course Outcome:** At the end of this course students will be able to

**CO1:** Formulate mathematical model for physical systems**.**
**CO2:** Analyse a system in time domain and frequency domain.
**CO3:** Determine the stability of a system using time and frequency domain analysis.
**CO4:** Develop and analyse state space models.
**CO5:** Design and analyse various controllers.

**MODULE 1: Introduction to Control System (2 Lectures)**
Introduction to control problem- Industrial Control examples.

**MODULE 2: Mathematical Modelling of Physical Systems (8 Lectures)**
Transfer function. System with dead-time System response. Control hardware and their models: potentiometers, synchro's, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.

**MODULE 3: Time Domain Analysis (8 Lectures)**
Time response of second-order systems, steady-state errors and error constants.
Performance specifications in time-domain. Routh stability criterion, Root locus method of design.

**MODULE 4: State Variable Analysis (6 Lectures)**
Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability &observability

**MODULE 5: Feedback Control Systems (6 Lectures)**
Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. Proportional, integral and derivative systems, Lead & lag compensators, Feed- forward and multi-loop control configurations, stability concept, and relative stability

**MODULE 6: Frequency Domain Analysis (10 Lectures)**
Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

**Textbooks/Reference Books:**


1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
3. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991.
4. Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| **ECE181505** | **Computer Networks** | **3-0-0** | **3** |

**Course Outcome:** At the end of this course students will be able to

**CO1:** Describe the layered protocol model and various network devices.
**CO2:** Analyse data-link layer protocols and perform error detection and correction in frames and accessing media.
**CO3:** Design sub netting and discuss various network design issues.
**CO4:** Analyse various transmission control protocols.
**CO5:** Develop understanding various protocols in Application layer.

**MODULE 1: Introduction of Networks** **(7 Lectures)**
Networks and History of networks, Types of Computer Networks, Reference Models - ISO-OSI Reference Model, TCP/IP Reference Model, Comparison of OSI and TCP/IP models.
Physical Layer: Guided Transmission Media – Twisted Pair, Coaxial and Fiber Optics, Wireless Transmission- Radio and Microwave transmission, Comparison of Network hardware - Repeaters, Routers, Bridges, Gateways, Hub, Switches.

**MODULE 2: Data Link Layer** **(8 Lectures)**
Data link Layer design issues, Framing, Error Detection and correction, sliding window protocols, Go Back N and Selective repeat, Switching
Medium Access Control: ALOHA, Carrier Sense Multiple Access protocols – persistent and non-persistent CSMA/CD, CSMA/CA, Ethernet Frame Format, Binary Exponential Back Off Algorithm, Comparison of types of Ethernet

**MODULE 3: Network Layer** **(10 Lectures)**
Subnetting and super netting, Network Layer Design Issues, Routing Algorithm, Congestion prevention policies, Quality of Service requirements- Buffering, Traffic shaping – Leaky bucket and Token bucket algorithm, Queuing Theory

**MODULE 4: Transport Layer** **(7 Lectures)**
Transport Service, Berkley Sockets, UDP, TCP, TCP Connection establishment and Release, Transmission Policy, Congestion Control

**MODULE 5: Application Layer** **(8 Lectures)**
HTTP - Overview, Persistent and non-persistent Connections, Message formats, Concept of Cookies and Web Cache, FTP, Electronic Mail – SMTP, Mail message formats, POP3, IMAP, DNS - Services provided by DNS, DNS Caching, Message format, SSH, Network Security, Authentication, IP Security, PGP

**Textbooks/Reference Books:**


1. Andrew S. Tanenbaum, Computer Networks, PHI.
2. Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw Hill.
3. Larry L. Peterson & Bruce S. Dave, Computer Networks-A Systems Approach, Morgan Kaufmann.
4. Fred Halsall, Computer Networking and the Internet.
5. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach.
6. Keshav, An Engineering Approach to Computer Networks, Addison Wesley.
7. W. Richard Stevens. TCP/IP Illustrated volume 1, Addison-Wesley.
8. William Stallings, Computer Networking with Internet Protocols, Prentice-Hall.

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| HS181506 | Engineering Economics | 3-0-0 | 3 |

**Course Outcomes (COs):**

The students will be able to

1. Acquire knowledge about economics its nature, scope and importance.
2. Understand the economic laws, principles, and theories and their relevance in present day situation.
3. Develop the ability of critical thinking to meet the challenges at the national and global problems.
4. Apply knowledge in finding out socio-economic problems and appropriate measures to deal with them.
5. Equip students with vital knowledge to run government and non-government institutions and bodies.
6. Assemble knowledge which is vital for industry and research and evolve proper policy for economic development.

**MODULE 1: Introduction to Economics (3 Lectures)**

Meaning and Definition of Economics, Nature and Scope of Economics, Concept of Micro and Macro Economics.

**MODULE 2: Utility Analysis (3 Lectures)**

Meaning of Utility, Utility Function, Consumers Equilibrium, Concept of Indifference Curve, properties of Indifference Curve, Equilibrium under Indifference Curve.

**MODULE 3 : Demand and Supply Analysis (4 Lectures)**

Law of Demand, Demand Function, Elasticity of Demand, Types of Elasticity of Demand, Measurement of Elasticity of Demand, Demand Forecasting, , Law of Supply, Supply Function.

**MODULE 4: Revenue, Production & Cost Analysis (4 Lectures)**

Average, Marginal and Total Revenue, Revenue Function, Average, Marginal and Total Cost, Cost Function, Short and Long Run Cost Curves. Break Even Point, Managerial Uses of Cost Function, Cobb Douglas Production Function.

**MODULE 5: Market Structure (4 Lectures)**

Concept of Market, Price-Output Determination under Perfect Competition, Monopoly Market and Monopolistic Competition.

**MODULE 6 : Money, Banking and National Income (8 Lectures)**

Definition of Money, Function of Money, Index Numbers, Construction of Index Numbers, value of Money, Causes of Inflation, Functions of Commercial and central bank, Central bank and its monetary policy, Money Market and Capital Market, Functions of Stock exchange, Concept of National Income, Measurement of National Income, Concept of Investment.

**MODULE 7: Introduction to Environmental Economics** **(5 Lectures)**
Concept of Environmental Economics, Cost -Benefit Analysis, Social Cost, Externalities, Concept of Pareto Equilibrium, Externality, Market Failure.

**MODULE 8: Public Finance** **(3 Lectures)**
Introduction to Public Finance, Concept of Budget, Types of Budget, Budget Receipts, Concept of Goods and services Tax (GST)

**Textbooks/Reference Books:**


1. Managerial Economics by V. Agarwal: Pearson Pvt. Limited, New Delhi.
2. Engineering Economics by Dr. A. Ahmed & G. Begum: Chandra prakash, Guwahati
3. Principles of Engineering Economics with Application by Dr. Z. A. Khan, A. N. Siddiquee, B. Kumar, M. H. Abidi: Cambridge University Press.
4. Public Finance and Public Policy by Dr. R. K Choudhury: Kalayani publishers
5. Quantitative Methods for Economics by R. Veerachamy: New Age International Publication Ltd.
6. Micro and Macro Economics by Dr. M. L. Seth: Educational Publishers, Agra
7. A Koutsoyiannis: Modern Microeconomics
8. Environmental Economics by R. N. Bhattacharya: Oxford Publication.

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| **ECE181511** | **Microprocessor and Embedded System Lab** | **0-0-2** | **1** |

**Course outcomes:**

On the completion of this laboratory course, the students will be able to:

**CO1:** Apply the fundamentals of assembly level / high level language programming of 8085 Microprocessor and 8051 Microcontroller to perform arithmetic, logical, data transfer applications and branch/loop instructions.

**CO2:** Interface a microprocessor and microcontroller with peripherals for various applications.

**List of Experiments:**

1. Programs involving:
   Data transfer instructions like: i) Byte and word data transfer in different addressing Modes ii) Block move (with and without overlap) iii) Block interchange

2. Programs involving: Arithmetic & logical operations like: i) Addition and Subtraction of multi precision nos. ii) Multiplication and Division of signed and unsigned Hexadecimal nos. iii) ASCII adjustment instructions iv) Code conversions

3. Programs involving: Bit manipulation instructions like checking: i) Whether given data is positive or negative ii) Whether given data is odd or even iii) Logical 1"s and 0"s in a given data iv) 2 out 5 code v) Bit wise and nibble wise palindrome

4. Programs involving: Branch/ Loop instructions like i) Arrays: addition/subtraction of N nos., Finding largest and smallest nos., Ascending and descending order ii) Two application programs using Procedures and Macros.

5. Programs involving String manipulation like string transfer, string reversing, searching for a string.

6. Programs for reading a Character from keyboard, Buffered Keyboard input, Display of character/ String on console

7. Interfacing Experiments: Experiments on interfacing 8085/86 with the following interfacing modules 1. Matrix keyboard interfacing 2. Seven segment display interface 3. Logical controller interface 4. Stepper motor interface 5. Analog to Digital Converter Interface (8 bit) 6. Light dependent resistor ( LDR ), Relay and Buzzer Interface to make light operated switches

****** ***Repeat the above listed programs for both 8085 microprocessor and 8051 microcontroller***

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| **ECE181512** | **Data Structure and Algorithm Lab** | **0-0-2** | **1** |

**Course Outcomes:** On completion of this lab course the students will be able to
**CO1:** Implement linear and non linear data structure in C programs

**CO2:** Implement different sorting, searching and hashing techniques.

**List of Experiments:**

1. Write a program to implement stack using array.
2. Write a program to implement Stack using linked list.
3. Write a program to implement a circular linked list.
4. Write a program to implement a Doubly Linked List.
5. Write a program to implement queue using array.
6. Write a program to implement queue using linked list.
7. Write a program to implement circular queue using linked list.
8. Write a program to implement a deque.
9. Write a program to implement priority queue using array.
10. Write a program to implement a linked list in descending order.
11. Write a program to insert an element in a sorted linked list.
12. Write a program to sort any six integers using linked list.
13. There are two linked lists A and B containing the following data:
    A: 7, 5, 3, 1, 20
    B: 6, 25, 32, 11, 9
    Write a function to combine the two lists such that the resulting list contains nodes in the following elements:
    7, 6, 5, 25, 3, 32, 1, 11, 20, 9
14. Write a program to add two polynomial using linked list. You are not allowed to create any additional node while writing the addition function.
15. Write a program to merge two sorted linked list, restricting common elements to occur only once only.
16. Write a program to delete the minimum value from a linked list.
17. Write a program to remove a specified node from a given Doubly Linked List and insert it at the end of the list.
18. Write a program to split a linked list in such a way that one list will have odd position elements and other will have even position elements. Starting position is ***one.***
19. Write a program to reverse a string using stack and implement the stack using linked list.
20. Write a program to generate a random matrix of 0's and 1's of order 4×4 and run the program for four times and draw all the four graphs.
21. Write a program to sort some words using linked list.
22. Write a program to sort some ***three*** digits number by comparing the leftmost to rightmost digit.
    Example: 358 264 187 (compare 8 of 358 with 4 of 264)
    Step1 264 358 187
    Similarly you compare all the digits and exchange the numbers.
23. Write a program to implement merge sort algorithm.
24. Write a program to implement insertion sort algorithm.
25. Write a program to implement bubble sort algorithm.
26. Write a program to implement selection sort algorithm.
27. Write a program to implement the Radix sort algorithm.

28. Write a program to implement the quick sort algorithm.
29. Write a program to implement linear search and binary search.
30. Write a program to find the inorder, preorder, and postorder traversal in a binary tree.
31. Write a program to implement a binary search tree.
32. Write a program to convert an infix expression to postfix expression.
33. Write a program to convert an infix expression to prefix expression.
34. Write a program to convert to evaluate a postfix expression.
35. Write a program using stack to convert decimal to binary, octal, and hexadecimal number system.
36. Write a program to a check a given expression containing balanced parentheses or not.
37. Write a program to implement Breadth First Search (BFS) in a graph.
38. Write a program to implement Depth First Search (DFS) in a graph.
39. Write a program to implement linear probing to insert a set of integers using the hash function ***k mod m*** in a hash table**,** where ***k*** is the key value and ***m*** is the size of hash table. (hash table size should be at least the size of the array)
40. Write a program to implement quadratic probing to insert a set of integers using the hash function ***k mod m*** in a hash table**,** where ***k*** is the key value and ***m*** is the size of hash table. (hash table size should be at least the size of the array)

| Course Code | Course Title | Hours per week L-T-P | Credit C |
|---|---|---|---|
| **ECE181513** | **Digital Communication Lab** | **0-0-2** | **1** |

**Course Outcomes:** On completion of this lab course the students will be able to

**CO1:** Design and implement digital modulation and demodulation techniques.

**CO2:** Design and implement coding techniques.

**List of Experiments: (**Perform any ten experiments)

1. To study pulse code modulation and demodulation
2. To study DPCM
3. To study ADPCM
4. To study FSK modulator/ demodulator
5. To study RZ, NRZ- L, NRZ- M encoders and decoders.
6. To study RZ- AMI encoders and decoders
7. To study the natural and flat top sampling.
8. Implement PAM, QAM using Simulink
9. Implement FSK, PSK using Simulink
10. Implement DPSK, QPSK using Simulink
11. Implementing Convolutional Encoder/Decoder using MATLAB.
12. Implementing Viterbi Algorithm using MATLAB.

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