GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

SEMESTER IV

Name of Department: - **Electronics and Communication Engineering**

1. Subject Code: **TEC 401** Course Title: **Communication Systems- I**
2. Contact Hours: **L: 3** **T: 0** **P: 0**
3. Examination Duration (Hrs): **Theory 3** **Practical 0**
4. Relative Weight: **CWA 25** **PRS 0** **MSE 25** **ESE 50** **PRE 0**
5. Credits: **3**
6. Semester: **Spring (Even)**
7. Subject Area: **Core Course**
8. Pre-requisite: **Signals and Systems**

9. **Course Outcomes:**	• Analyze and compare different analog modulation schemes for their efficiency and bandwidth. • Analyze and compare the performances of AM and FM receiver. • Random variable, random process and their application for Noise analysis. • Analyze the behavior of a communication system in presence of noise. • Investigate Analog pulsed modulation systems and analyze their system Performances. • Successful completion of this course enables students to apply the concepts of Analog modulation and demodulation for radio & TV receivers.

10. **Details of the Course:**

S. No.	Contents	Contact Hours
1	**Amplitude Modulation Systems:** Modulation, Need of modulation, Model of communication system, Amplitude Modulation: Equation for AM wave, Modulation Index, Power and current relationships, transmission and power efficiency, Generation and Demodulation of DSB-FC, DSB-SC, SSB-SC and VSB Signals, Spectral characteristics of amplitude modulated signals, Comparison of Amplitude Modulation Systems; AM receiver and its characteristic.	12
2	**Angle Modulation Systems:**	12

	Phase and Frequency Modulation: Narrow Band and Wideband FM & PM, Spectral characteristics of angle modulated signals, Generation and Demodulation of FM Signal, PLL, Communication Receiver.	
3	**Noise:** Introduction – internal and external noise, noise equivalent bandwidth, S/N ratio, Noise Figure, Equivalent Noise temperature, Cascade connection of two port network.	6
4	**Performance of Continuous Wave Modulation Systems:** Introduction: Review of probability and random process. Gaussian and white noise characteristics, Analog communication model, SNR Calculation in DSB-SC,SSB-SC, DSB-FC & FM systems, FM threshold effect; Pre-emphasis and De-emphasis in FM, Comparison of performances.	8
5	**Pulse Modulation System:** Sampling process, Generation and detection of PAM, PWM, and PPM and its SNR performances.	5
	Total	**43**

11. **Suggested Books:**

SL. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	Text Books	
1.	B. P. Lathi, 'Modern Digital and Analog Communication', Oxford Publication, 3/e	2005
2.	Simon Haykin, 'Communication Systems', John Willey, 4/e	2001
3.	Taub and Schilling, 'Principles of Communication System', Tata McGraw-Hill, 4/e	1995
4.	HWEI HSU, Analog and Digital Communications, Schaum Outline Series, 2/e.	2003
	Reference Books	
1.	Roddy and Coolen, ' Electronic Communication', Prentice Hall of India, 4/e.	1998
2.	Singh and Sapre, 'Communication system', TMH, 2/e.	2007
3.	A. Papoulis, " Probability, Random variables and Stochastic processes", MGH, 4/e.	2002

12	**Mode of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam / Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: - **Electronics and Communication Engineering**

1. Subject Code: **TEC 402** Course Title: **Analog Integrated Circuits**
2. Contact Hours: **L:** 3 **T:** 0 **P:** 0
3. Examination Duration (Hrs): **Theory** 3 **Practical** 0
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: 3
6. Semester: **Spring (Even)**
7. Subject Area: **Core Course**
8. Pre-requisite: **Electronics Devices and Circuits.**

9. Course Outcomes:	• Analysis of various characteristics of differential amplifier configurations • Understanding of characteristic and operation of op-amp. • Design and implementation of linear applications of op-amp • Design and implementation of non-linear applications of op-amp • Evaluation of active filter transfer function with frequency response and voltage regulator implementation. • After completion of this course student will be able to design and evaluate op amp output.

10. **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	**Brief review of differential amplifier (DC and AC analysis) OP-AMP Fundamentals:** Input stage, intermediate stage circuits, constant current bias circuits, current mirror, active load, level shifter, output stage, DC and AC characteristics.	10
2	**IC OP-AMP Applications:** Basic building blocks using OP-AMPS. Inverting/Non-inverting amplifier, (gain, input and output resistance, bandwidth), Summer and difference amplifier, Integrators, Differentiators, VCVS, CCVS and VCCS, Instrumentation Amplifiers.	8
3	**Non-linear Circuits:** Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Multivibrator, 555 Timer and applications, Oscillators(Hartley,Colpitts ,RC	10

	phase shift), PLL & Capture range.	
4	**Active Filters:** Frequency response, Characteristics and terminology, Active versus passive filters **Low Pass Filter:** First order low pass active filter, second order active filter model, second order low pass filter characteristics, Sallen-Key unity gain filter, Sallen-Key equal component filter. High pass active filter, Band pass filter: single op-amp band pass filter, State variable filter	8
5	**Voltage Regulators:** OP-AMP Regulators, IC Regulators, Fixed Voltage, Regulators (78/79, XX).	6
	Total	**42**

11. **Suggested Books:**

SL. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	Text Books	
1.	Sedra and Smith, 'Microelectronic Circuits', Oxford University press, 5th Edition.	2005
2.	J. Michael Jacob, 'Applications and design with Analog Integrated Circuits', PHI, 2nd Edition.	2004
	Reference Books	
1.	Razavi, B, 'RF Microelectronics', Second Edition, Prentice Hall	2007
2.	B.P. Singh and Rekha Singh, 'Electronic Devices and Integrated Circuits; Pearson Education, 1st Edition.	2006

12.	**Mode of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam / Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: **Electronics and Communication Engineering**

1. Subject Code: **TEC 403** Course Title: **Microprocessor and its Applications**
2. Contact Hours: **L:** 3 **T:** 0 **P:** 0
3. Examination Duration (Hrs): **Theory** 3 **Practical** 0
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: 3
6. Semester: **Spring (Even)**
7. Subject Area: **Core Course**
8. Pre-requisite: **Digital Electronics**

9. **Course Outcomes:**	• Understanding of microprocessor 8085 hardware. • Understand 8085 instruction set and ability to utilize it in assembly language programming. • Understand 8086 instruction set and ability to utilize it in assembly language programming. • Interfacing of memory and devices with 8085/8086. • Apply the concept of 8085/8086 programming to program real time applications. • Successful completion of this course will act as foundation for Microcontroller and Embedded system courses.

10. **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	**Introduction to Microprocessors:** Evolution of Microprocessors, Microprocessor Internal Architecture, hardware model of 8085, Pin diagram and function of each pin, memory interfacing.	8
2	**Programming with 8085:** Instruction set, programming model of 8085, addressing modes, assembly language programming, peripheral I/O, memory mapped I/O, 8085 Interrupts, Stack and subroutines.	8
3	**16 Bit Processor:** 16-bit Microprocessors (8086): Architecture, pin diagram, Physical address, segmentation, memory organization, Addressing modes, Instruction set ,Assembly Language Programming of 8086, comparison of 8086 & 8088	10

4	**Interfacing (Data Transfer) with Microprocessor:** Data Transfer Schemes: Introduction, handshaking signals, Types of transmission, 8255 (PPI), Serial Data transfer (USART 8251), memory interfacing, 8257 (DMA), programmable interrupt Controller (8259).	8
5	**Interfacing of Microprocessor with Timing Devices:** Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, Interfacing of 8253, applications. Introduction to DAC & ADC, ADC & DAC Interfacing (0808, 0809).	7
	Total	**41**

11. Suggested Books:

SL. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	Text Books	
1.	Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.	2006
2.	A.K.Ray & K.M.Bhurchandi, Advanced Microprocessors and peripherals , Tata McGraw Hill, 2000.2nd edition	2000
	Reference Books	
1.	Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, TMH.	2006
2.	YU-Cheng Liu & Glenn A Gibson, Microprocessor System, Architecture Programming & Design,PrenticeHall,Inc., 2 nd edition.	2010

12.	**Mode of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam / Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: - **Electronics and Communication Engineering**

1. Subject Code: **TEC 404** Course Title: **Electromagnetic Field Theory**
2. Contact Hours: **L:** 3 **T:** 0 **P:** 0
3. Examination Duration (Hrs): **Theory** 3 **Practical** 0
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: 3
6. Semester: **Spring (Even)**
7. Subject Area: **Core Course**
8. Pre-requisite: **Physics.**

9.**Course Outcomes:**	• Understanding the concept of vector algebra, gradient, divergence and curl. • Analyzing the electric field and magnetic field for various structure. • Evaluation of E-M wave parameter in different medium. • Applying the boundary concept for wave guide structure. • Modeling of Transmission line and its various parameter. • After completion of this course student will be able to analyze the behavior of E and H filed in various medium.

10. **Details of the Course: -**

Sl. No.	Contents	Contact Hours
1	**Introduction to Electromagnetic:** Vector Algebra, Co-ordinate Systems, Scalar and Vector fields, Line integral, Surface integral, Volume integral, Gradient of a Scalar field, Divergence of a vector field, Curl of a Vector Field, Divergence Theorem, and Stoke's theorem.	8
2	**Static Fields:** Coulomb's law, Electric field intensity, Electric flux density, Gauss' Law & its application, Electrostatic Potential, Poisson's & Laplace equation, Energy density in electrostatics field, Dielectric Constant, Continuity equation, Boundary Condition in electrostatics, Biot- Savart Law, Ampere's law & its application, Magnetic flux density, Force due to magnetic field, Magnetic energy, Boundary Condition in Magnetostatics.	12
3	**Maxwell's Equation and Electromagnetic Wave Propagation:** Uniform plane waves, Poynting theorem, Wave polarization, Reflection & Refraction of a plane wave at normal incidence & oblique	8

	incidence.	
4	**Parellel Plate Waveguide:** Analysis of TE, TM and TEM waves.	6
5	**Introduction to Transmission Lines:** Transmission Line Parameters, Transmission Line Equations, Input Impedance, Reflection Coefficient & Standing Wave Ratio, Power, Quarter wave transformer and impedance matching through single stub using smith chart.	8
	Total	**42**

11. **Suggested Books:**

SL. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	Text Books	
1.	Mathew N.O. Sadiku, 'Elements of Electromagnetics', Third Edition, Oxford University Press	2011
2.	Hyatt, William, 'Engineering Electromagnetics', Seventh Edition, McGraw Hill	2011
	Reference Books	
1.	Griffiths D.J., 'Introduction to Electrodynamics' 3rd Edition, PHI.	2010
2.	Krauss, J.D., 'Electromagnetics with Applications'5th edition, TMH	2012
3.	Jordan & Balmain, 'Electromagnetic Wave & Radiating Systems,' 2nd edition, PHI.	2010

12.	**Mode of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam / Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: - **Electronics and Communication Engineering**

1. Subject Code: **TOE 410** Course Title: **Data Structure**
2. Contact Hours: L: **3** T: **0** P: **0**
3. Examination Duration (Hrs): Theory **3** Practical **0**
4. Relative Weight: CWA **25** PRS **0** MSE **25** ESE **50** PRE **0**
5. Credits: **3**
6. Semester: **Spring (Even)**
7. Subject Area: **Open Elective**
8. Pre-requisite:

9. **Course Outcomes:**	• Familiarity with major algorithms and data structures. • Identify the strengths and weaknesses of different data structures. • Selection of appropriate data structure and algorithm design method for a specified application. • Using various data structures effectively in application programs. • Evaluate algorithm efficiency. • Possess the knowledge of various existing algorithms.

10. **Details of the Course:**

SL. No.	Contents	Contact Hours
1	**Introduction:** Basic Terminology, Pointer and dynamic memory allocation, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Array as Parameters, Ordered List, Sparse Matrices. Stacks: Array. Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, and Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, tail recursion.	8
2	**Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Dequeue, and Priority Queue.	8

	Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list.	
3	**Trees:** Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary Trees. Traversing Threaded Binary trees, Huffman algorithm & Huffman tree. **Searching and Hashing:** Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.	8
4	**Sorting:** Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting. **Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees.	8
5	**File Structures:** Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons, Graph, Traversal(DFS,BFS) ,Minimum spanning tree.	8
	Total	**40**

11. **Suggested Books:**

SL. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
	Text Books	
1.	Horowitz and Sahani, "Fundamentals of data Structures", Galgotia	
2.	R. Kruse et al, "Data Structures and Program Design in C" Pearson Education.2nd edition.	
3.	A M Tenenbaum et al, "Data Structures using C & C++", PHI	
4	Lipschutz, "Data Structure", TMH	

5	K Loudon, "Mastering Algorithms With C", Shroff Publisher & Distributors	
6	Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.	

12	**Mode of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam / Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: **Electronics and Communication Engineering**

1. Subject Code: **XCS 400** Course Title: **Career Skills**
2. Contact Hours: L: **3** T: **0** P: **0**
3. Examination Duration (Hrs): Theory **3** Practical **0**
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: **3**
6. Semester: **Spring (Even)**
7. Subject Area: **HUSS**
8. Pre-Requisite: **Communication**

9. **Course Outcomes:**	• Have a logical approach to the problems and at the same time they will be able to differentiate between the strong and the week arguments and validity of the statement. • It covers the various approaches to improve the reasoning ability of the students by using the different methods. • Student would have learned the different types of problems may it be related to the coding or other complex types of problems which are related to the sequence detection etc. • A basic Knowledge of the data interpretation. • Along with it the knowledge of puzzles and different methods to solve the puzzles in an easier way is also included. • This course will provide the foundation for the students to develop the basic skills of aptitude and logical reasoning.

10. **Details of the Course:**

S.NO	CONTENT	CONTACT HOURS
1.	**Functional Grammar:** Parts of speech, articles, parallel construction, subject verb agreement.	6
2.	**Logical Reasoning :** Blood relation, puzzle test, syllogism, classification, seating/placing arrangements,	6
3.	**Logical Reasoning:** Ranking and comparison, sequential order and things, selection based on conditions, data interpretation	6

4.	**Building Vocabulary:** Analogy, Para jumbles, antonyms and synonyms.	6
	Total	**24**

11. **Suggested Books:**

Sl. No.	Name Of Authors/Books/Publishers	Year Of Publication/Reprint
	For Verbal Section:	
1.	Spoken English for India by R.K.Bansal and J.B. Harrison- Orient Longman	
2.	A practical English Grammar by Thomson and Martinet-Oxford University Press	
3.	Professional Communication by Malti Aggarwal	
4.	English grammar, composition and correspondence by M.A.Pink and A.E.Thomas –S.Chand and Sons.Word Power by Blum Rosen-Cambridge University Press	
5.	A Dictionary of Modern Usage-Oxford University Press	
	For Aptitude Section:	
1.	Quantitative aptitude by R.S Agarwal	
2.	Verbal and Non Verbal Reasoning by R.S Agarwal	
3.	All books of puzzles to puzzle to puzzle you by Shakuntala Devi.	
4.	Question Bank on the practice exercise (Created for internal use)	

12.	**Mode Of Evaluation**	Test / Quiz / Assignment / Mid Term Exam / End Term Exam.

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: **Electronics and Communication Engineering**

1. Subject Code: **PEC 401** Course Title: **Communication Systems- I Lab**
2. Contact Hours: **L:** 0 **T:** 0 **P:** 2
3. Examination Duration (Hrs): **Theory** 0 **Practical** 3
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: 1
6. Semester: **Spring (Even)**
7. Subject Area: **Core Course**
8. Pre-requisite: **Knowledge of CRO and fundamentals of MATLAB.**

9. **Course Outcomes:**	• Demonstrate understanding and analyzing the waveforms of DSB-FC, DSB-SC, SSB-SC. • Analyzing different amplitude modulation techniques (DSB-FC, DSB-SC) angle modulation techniques (FM & PM) using MATLAB.. • Understanding and analyzing of different angle modulation techniques (FM & PM). • Understanding and analyzing of Pulse amplitude modulated & demodulated waveforms.

10. **Details of the Course:**

Sl. No.	Contents
1.	Generation of amplitude modulated (DSB-FC) waveform and determines the modulation indices.
2.	Generation of double sideband suppressed carrier (DSB-SC) waveform using balanced modulator.
3.	Generation of single sideband suppressed carrier (SSB-SC) signal.
4.	Generation of frequency modulated (FM) signal using voltage controlled oscillator.
5.	Demodulation of FM signal using phase locked loop (PLL).
6.	Understanding the pulse amplitude modulation (PAM) and demodulation circuit and draw the waveform for the same.
7.	Simulation of double sideband suppressed carrier (DSB-SC) signal using MATLAB.
8.	Simulation of amplitude modulated (DSB-FC) signal using MATLAB
9.	Simulation of frequency modulated (FM) signal using MATLAB.
10.	Simulation of phase modulated (PM) signal using MATLAB.
	Innovative Experiments

1.	To analyze the radiation pattern of Yagi-Uda antenna.
2.	Getting familiar with the features and basic operations of the spectrum analyzer and investigating signals in frequency domain.
3.	To plot the frequency domain representation of DSB-FC, DSB-SC and SSB-SC using MATLAB.
4.	To plot the frequency domain representation of FM, and PM using MATLAB.
5.	To study the effect of Sampling on the spectrum of analog, Discrete time signal using MATLAB.
6.	To demonstrate the effect of AWGN in DSB-FC, DSB-SC and SSB-SC using MATLAB.
7.	Simulation of frequency modulation and demodulation in noisy condition using MATLAB.
8.	To plot the frequency domain representation of PWM using MATLAB.

11.	**Mode of Evaluation**	Viva / Quiz / Mid Term Lab Exam / End Term Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: **Electronics and Communication Engineering**

1. Subject Code: **PEC 402** Course Title: **Analog integrated Circuits Lab**
2. Contact Hours: **L:** 0 **T:** 0 **P:** 2
3. Examination Duration (Hrs): **Theory** 0 **Practical** 3
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: 1
6. Semester: Fourth
7. Subject Area: Core Course
8. Pre-requisite: **Electronics Circuits Lab**

9. **Course Outcomes:**	• To design, test and implement open loop and closed loop linear application. • To design and implement RC Active filters. • To design and test positive feedback based circuits. • To analyze CMRR of differential amplifier.

10. **Details of the Course:**

Sl. No.	Contents
1.	To Design and Test open loop & closed loop inverting and non-inverting op-amp.
2.	To Design and Test op-amp based Adder and Subtractor circuits.
3.	To Design and Test op-amp based integrator and differentiator circuits.
4.	To Design and Test op-amp based Active RC low pass filters.
5.	To Design and Test op-amp based Active RC high pass filters.
6.	To Design and Test op-amp based Active Band pass & Band reject filters.
7.	To Design and Test op-amp based comparator circuits.
8.	To realize op-amp based triangular wave generator.
9.	To find CMRR of a differential amplifier.
10.	To design and test monostable multivibrator using 555 timer.
	Innovative
1.	To design op-amp based cascaded circuits.

2.	To design a state variable filter.
3.	To design and Test Op-amp based PLL.
4.	As suggested by lab in charge.

11.	**Mode of Evaluation**	Viva / Quiz / Mid Term Lab Exam / End Term Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: **Electronics and Communication Engineering**

1. Subject Code: **PEC 403** Course Title: **Microprocessor Lab**
2. Contact Hours: **L:** 0 **T:** 0 **P:** 2
3. Examination Duration (Hrs): **Theory** 0 **Practical** 3
4. Relative Weight: **CWA** 25 **PRS** 0 **MSE** 25 **ESE** 50 **PRE** 0
5. Credits: 1
6. Semester: **Spring (Even)**
7. Subject Area: **Core Course**
8. Pre-requisite: **Digital Electronics Lab**

9.**Course Outcomes:**	• Understanding of 8085 and 8086 microprocessor Kit &its associated peripherals. • Implementation of different assembly language programs on microprocessor based microcomputer kit. • Ability to test and debug assembly language program in the laboratory. • Understand real mode Memory addressing and ability to interface various devices to the microprocessor.

10. **Details of the Course:**

Sl. No.	Contents
1.	Write program in 8085 to swap two 8 bit numbers.
2.	Write a program in 8085 to move a block of data bytes from one location to another location.
3.	Write programs in 8085 to perform addition & subtraction of 8 bit number with carry / borrow.
4.	Write a program in 8085 for addition of 16 bits numbers with carry.
5.	(a) Write an ALP in 8085 to find one's complement of 8 /16bit data. (b) Write an ALP in 8085 to find two's complement of 8/16 bit data.
6.	Write an ALP in 8085 to add two 8 bit BCD data.
7.	(a) Write an ALP in 8085 to find larger number between two numbers. (b) Write an ALP in 8085 to find smaller number between two numbers.
8.	Write an ALP in 8085 to find largest /smallest in a series of n number.
9.	Write an ALP in 8085 to find multiplication of 8 bit number.
10.	(a) Write a program in 8086 to add two 16 bit numbers given by the user.

	(b) Write a program in 8086 to subtract two 16 bit numbers given by the user
11.	(a) Write a program in 8086 to multiply two 16 bit data. (b) Write a program in 8086 to divide: 32 bit data by 16 bit data.
12.	(a) Write a program in 8086 to find the largest no. from an array of n numbers stored in an array. (b) Write a program in 8086 to perform sorting of given set of numbers
13.	Write a program in 8086 to add and subtract two 8 bit BCD numbers.
14.	(a) Write a program in 8086 to convert a BCD number to its ASCII code equivalent. (b) Write a program in 8086 to convert a BCD number to its grey code equivalent

Innovative	
1.	Write an ALP for Traffic light controller using 8085.
2.	Write an ALP for interfacing of PPI 8255 with microprocessor 8085.
3.	A data string of no. of bytes is converted to its equivalent 2's complement using 8086 string instruction.

11.	**Mode of Evaluation**	Viva / Quiz / Mid Term Lab Exam / End Term Lab Exam

GRAPHIC ERA (DEEMED TO BE UNIVERSITY), DEHRADUN

Name of Department: **Electronics and Communication Engineering**

1. Subject Code: **POE 410** Course Title: **Data Structure Lab**
2. Contact Hours: L: **0** T: **0** P: **2**
3. Examination Duration (Hrs): Theory **0** Practical **3**
4. Relative Weight: CWA **25** PRS **0** MSE **25** ESE **50** PRE **0**
5. Credits: **1**
6. Semester: **Spring (Even)**
7. Subject Area: **Open Elective**
8. Pre-requisite:

9. **Course Outcomes:**	• This will boost the basic programming skills of the student in C and C++ programming. • Better understanding to the concept of the stacks and queue and their use with dynamic memory allocation. • Learning and understanding in a better way to sort the arrays and lists. • Implementation of various algorithms.

10. **Details of the Course:**

Sl. No.	Contents
1.	Write Program in C or C++ for Array implementation of Stack, Queue, Circular Queue, List.
2.	Write Program in C or C++ for Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
3.	Write Program in C or C++ for Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
4.	Write Program in C or C++ for Implementation of Searching and Sorting Algorithms.
5.	Write Program in C or C++ for Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm.

11.	**Mode of Evaluation.**	Viva / Quiz / Mid Term Lab Exam / End Term Lab Exam