SCHEME OF EXAMINATION

and

SYLLABI

for

Bachelor of Technology
Electronics and Communication Engineering

Offered by
University School of Engineering and Technology

3rd SEMESTER

Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]
www.ipu.ac.in
## Bachelor of Technology
### (Electronics and Communication Engineering)
#### Third Semester Examination

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Paper ID</th>
<th>Paper</th>
<th>L</th>
<th>T/P</th>
<th>Credits</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETMA-201</td>
<td></td>
<td>Applied Mathematics – III</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ETEC-203</td>
<td></td>
<td>Analog Electronics - I</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>M</td>
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<tr>
<td>ETEC-205</td>
<td></td>
<td>Switching Theory and Logic Design</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>M</td>
</tr>
<tr>
<td>ETEC-207</td>
<td></td>
<td>Electronic Instruments and Measurements</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>M</td>
</tr>
<tr>
<td>ETCS-209</td>
<td></td>
<td>Data Structures</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ETEC-211</td>
<td></td>
<td>Signals and Systems</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
</tbody>
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**THEORY PAPERS**

**PRACTICAL/VIVA VOCE**

<table>
<thead>
<tr>
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<th>Paper ID</th>
<th>Paper</th>
<th>L</th>
<th>T/P</th>
<th>Credits</th>
<th>Status</th>
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<td>NCC/NSS**</td>
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**TOTAL** | 18       | 16        | 29   |      |

M: Mandatory for award of degree

* Some lab experiments must be performed using any circuit simulation software e.g. PSPICE/Scilab/MATLAB/LabVIEW etc.

** NCC/NSS can be completed in any one semester from Semester 1 – Semester 4. It will be evaluated internally by the respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards.
NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.TECH AND M.TECH

1. ET stands for Engineering and Technology.
2. PE stands for Power Engineering.
3. ME stands for Mechanical Engineering.
4. MT stands for Mechatronics.
5. AT stands for Mechanical and Automation Engineering.
6. EE stands for Electrical and Electronics Engineering.
7. EL stands for Electrical Engineering.
8. IT stands for Information Technology.
9. CS stands for Computer Science and Engineering.
10. CE stands for Civil Engineering.
11. EC stands for Electronics and Communications Engineering.
12. EN stands for Environmental Engineering.
13. TE stands for Tool Engineering.
14. MA stands for Mathematics.
15. HS stands for Humanities and Social Sciences.
16. SS stands for Social Services.
APPLIED MATHEMATICS-III

Paper Code: ETMA-201
Paper: Applied Mathematics-III

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks: 75
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives: The objective of this course is to teach the students the applications of Fourier series, Fourier transform, difference equation and numerical methods to solve various engineering problems.

UNIT-I
Fourier series: Definition, Euler’s formula, conditions for Fourier expansion, functions having points of discontinuity, change of intervals, even and odd functions, half range series, harmonic analysis. Fourier Transforms: Definition, Fourier integral, Fourier transform, inverse Fourier transform, Fourier sine and cosine transforms, properties of Fourier transforms (linearity, scaling, shifting, modulation), Application to partial differential equations.

UNIT-II
Difference equation: Definition, formation, solution of linear difference equation with constant coefficients, simultaneous difference equations with constant coefficients, applications of difference equations. Z-transform: Definition, Z-transform of basic functions, properties of Z-transform (linearity, damping, shifting, multiplication), initial value theorem, final value theorem, convolution theorem, convergence of Z-transform, inverse of Z-transform, Application to difference equations.

UNIT-III

UNIT-IV

Text Books:

Reference Books:
[R5] Schaum’s Outline on Fourier Analysis with Applications to Boundary Value Problem, Tata McGraw-Hill
ANALOG ELECTRONICS-I

Paper Code: ETEC-203                              L  T  C
Paper: Analog Electronics-I                          3   1   4

INSTRUCTIONS TO PAPER SETTERS:                   Maximum Marks: 75
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or
short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit
should have two questions. However, student may be asked to attempt only 1 question from each unit. Each
question should be 12.5 marks.

Objective: The objective of teaching this subject is to impart in depth understanding of the concepts of biasing in
active circuits and employing simple models to represent nonlinear and active elements in circuits. It also
includes the operation of the circuits at high frequencies and effects of feedback. The analysis of power
amplifier & tuned amplifiers is also dealt with.

UNIT – I
Review of diode and BJT, Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self-bias, bias
stability with respect to variations in Ico, VBE & β. Stabilization factors, thermal stability. Bias compensation
techniques.
Small signal amplifiers: CB, CE, CC configurations, hybrid model for transistor at low frequencies, RC coupled
amplifiers, mid band model, gain & impedance, comparisons of different configurations. Emitter follower, Darlington pair (derive voltage gain, current gain, input and output impedance). Hybrid-model at high frequencies
(π model).

[T1,T2,T3][No. of Hours: 11]

UNIT – II
Multistage Amplifiers: Cascade and cascode amplifiers, Calculations of gain, impedance and bandwidth.
Design of multistage amplifiers.
Feedback Amplifiers: Feedback concept, Classification of Feedback amplifiers, Properties of negative
Feedback amplifiers, Impedance considerations in different configurations. Analysis of feedback Amplifiers.

[T1,T2,T3][No. of Hours: 11]

UNIT – III
Field Effect Transistor: Introduction, Classification, FET characteristics, Operating point, Biasing. FET small
signal Model, enhancement & Depletion type MOSFETS, MESFET, FET Amplifier configurations (CD,CG and
CS).
Introduction to UJT, SCR, Triac and Diac (working, construction, characteristics and application),UJT relaxation
oscillator.

[T1,T2,T3][No. of Hours: 11]

UNIT – IV
Power Amplifiers: Power dissipations in transistors, Amplifiers Classification, (Class-A, Class-B, Class-C,
Class-AB) Efficiency analysis, Push-pull and complementary Push-pull amplifiers, cross over distortion and
harmonic distortion in push pull amplifier. Tuned amplifiers (single, double & stagger tuned amplifier).

[T1,T2,T3][No. of Hours: 11]

Text Books:

Reference Books:
[R2] B.Kumar & Shail Bala Jain, “Electronic Devices And Circuits” PHI
**SWITCHING THEORY AND LOGIC DESIGN**

**Paper Code:** ETEC-205

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective:** The objective of the paper is to facilitate the student with the knowledge of Logic Systems and Circuits, thereby enabling the student to obtain the platform for studying Digital Systems and Computer Architecture.

**UNIT- I**

**Number Systems and Codes:** Decimal, Binary, Octal and Hexadecimal Number systems, Codes- BCD, Gray Code, Excess-3 Code, ASCII, EBCDIC, Conversion between various Codes.

**Switching Theory:** Boolean Algebra- Postulates and Theorems, De’ Morgan’s Theorem, Switching Functions- Canonical Forms- Simplification of Switching Functions- Karnaugh Map and Quine Mc-Clusky Methods.

**Combinational Logic Circuits:** Review of basic gates- Universal gates, Adder, Subtractor, Serial Adder, Parallel Adder, Carry Propagate Adder, Carry Look-ahead Adder, Carry Save Adder, Comparators, Parity Generators, Decoder and Encoder, Multiplexer and De-multiplexer, ALU, PLA and PAL.

**UNIT- II**

**Integrated circuits:** TTL and CMOS logic families and their characteristics. Brief introduction to RAM and ROM.

**Sequential Logic Circuits:** Latches and Flip Flops- SR, , D, T and MS-JK Flip Flops, Asynchronous Inputs.

**Counters and Shift Registers:** Design of Synchronous and Asynchronous Counters: Binary, BCD, Decade and Up/Down Counters, Shift Registers, Types of Shift Registers, Counters using Shift Registers- Ring Counter and Johnson Counter.

**UNIT- III**

**Synchronous Sequential Circuits:** State Tables State Equations and State Diagrams, State Reduction and State Assignment, Design of Clocked Sequential Circuits using State Equations.

**Finite state machine:** capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and merger chart methods-concept of minimal cover table.

**UNIT- IV**

**Algorithmic State Machine:** Representation of sequential circuits using ASM charts synthesis of output and next state functions; Data path control path partition-based design.

**Fault Detection and Location:** Fault models for combinational and sequential circuits, Fault detection in combinational circuits; Homing experiments, distinguishing experiments, machine identification and fault detection experiments in sequential circuits.

**Text Book:**


**Reference Books:**


ELECTRONIC INSTRUMENTS AND MEASUREMENTS

Paper Code: ETEC-207
Paper: Electronic Instruments and Measurements

### INSTRUCTIONS TO PAPER SETTERS:

<table>
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**Objective:** Electronic Instruments are being used in industries and in Labs. The subject provides material for a first course on electronic instruments. It details the basic working and use of different instruments.

**UNIT – I  Introduction to Metering**
Errors in Measurement: Types of Static Errors; Gross Errors; Systematic Errors; Random Errors; Sources of Errors.
Basic Meter Movement: Moving Coil and Moving Iron type of instruments.
Display Devices: Digital display system and indicators, Classification of displays, Light Emitting Diodes (LED), Liquid Crystal Display (LCD).
Electrical Standards & Calibration.

**UNIT – II  Basic Instruments**
DC Ammeter, Multi range ammeters, Extending of ammeter ranges, RF Ammeter, Effect of frequency on calibration. DC Voltmeter, Multi range voltmeter, extending Voltmeter ranges, Transistor Voltmeter, Chopper type DC amplifier Voltmeter (Micro-voltmeter), Solid-State Voltmeter, AC Voltmeter using rectifiers, True RMS Voltmeter.
Digital Metering: Dual slope integrating type DVM (Voltage to Time conversion), Integrating type DVM (Voltage to Frequency Conversion), Resolution and sensitivity of digital meters, General specifications of a DVM, Digital Multimeters, Digital frequency meter, Digital measurement of time, Universal counter, Electronic counter, Digital tachometer, Digital pH meter, Digital phase meter, Digital capacitance meter.

**UNIT – III  Cathode Ray Oscilloscope**
Basic Principle, CRT features, Block diagram of oscilloscope, single/dual beam CRO, dual trace oscilloscope, (VHF) sampling oscilloscope; storage oscilloscope (For VLF Signal), Measurement of phase and frequency by Lissajous figures method. Oscilloscope as a Bridge Null detector, standard specifications of a single beam CRO, probes for CRO, Digital Storage Oscilloscope (DSO), Fiber Optic CRT recording oscilloscope.

**UNIT – IV  Electronic Instruments**
Fixed / Variable Frequency AF Oscillator, Signal Generator, Function Generator, (sine, square and triangular wave generator), Frequency selective and Heterodyne Wave Analyzer.
Digital Data Recording, Potentiometric Recorder (Multipoint), Digital Memory Waveform Recorder (DWR), Introduction to transducers, Data Acquisition System; Introduction, Objective of a DAS, Single Channel Data Acquisition System, Multi-Channel DAS.

**Text Books:**

**Reference Books:**

Scheme and Syllabi for B. Tech-ECE. 1st year (Common to all branches) w.e.f. batch 2014-15 and (2nd, 3rd & 4th years) w.e.f. batch 2013-14 approved in the 22nd BOS of USET on 30th June, 2014 and approved in the 37th AC Sub Committee Meeting held on 10th July, 2014.
**DATA STRUCTURES**

**Paper Code:** ETCS-209  
**Paper:** Data Structures

<table>
<thead>
<tr>
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<th>T</th>
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<td>3</td>
<td>1</td>
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**INSTRUCTIONS TO PAPER SETTERS:**

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2. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, the student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective:** To understand the programming and the various techniques for enhancing the programming skills for solving and getting efficient results.

**UNIT – I:**
Introduction to programming methodologies and design of algorithms. Abstract Data Type, array, array organization, sparse array. Stacks and Stack ADT, Stack Manipulation, Prefix, infix and postfix expressions, their interconversion and expression evaluation. Queues and Queue ADT, Queue manipulation. General Lists and List ADT, List manipulations, Single, double and circular lists.

**UNIT – II:**
Trees, Properties of Trees, Binary trees, Binary Tree traversal, Tree manipulation algorithms, Expression trees and their usage, binary search trees, AVL Trees, Heaps and their implementation.

**UNIT – III:**
Multiway trees, B-Trees, 2-3 trees, 2-3-4 trees, B* and B+ Trees, Graphs, Graph representation, Graph traversal.

**UNIT – IV:**
Sorting concept, order, stability, Selection sorts (straight, heap), insertion sort (Straight Insertion, Shell sort), Exchange Sort (Bubble, quicksort), Merge sort (only 2-way merge sort). Searching – List search, sequential search, binary search, hashing concepts, hashing methods (Direct, subtraction, modulo-division, mid-square, folding, pseudorandom hashing), collision resolution (by open addressing: linear probe, quadratic probe, pseudorandom collision resolution, linked list collision resolution), Bucket hashing.

**Text Books:**

**Reference Books:**
SIGNALS AND SYSTEMS

Paper Code: ETEC-211        L  T/P  C
Paper: Signals and Systems        3  1  4

INSTRUCTIONS TO PAPER SETTERS:

Objective: This is the first course for representation of various types of electronic signals and LTI systems. Applications of Fourier series, understanding of Fourier transforms and sampling of various signals. Analysis of various systems using the Z transforms, Laplace transforms.

UNIT- I
Singular Functions: Unit impulse, unit step, unit ramp, complex and exponential, parabolic, Signum, Sinc etc. Properties of unit impulse in continuous and discrete domain, properties of basic functions w.r.t. orthogonality.
Transformation in independent variable of signals: Time scaling, Time shifting, Amplitude scaling. Representation of signals in terms of singular function and orthogonal functions.
Systems: Definition of system, types of systems: Linear and nonlinear, static and dynamic, causal and non-causal, time variant and invariant, invertible and non-invertible, stable and non-stable. System described by differential equation and difference equation.

[TL, T2] [No. of Hrs. 12]

UNIT- II

[TL, T2] [No. of Hrs. 11]

UNIT- III
Magnitude- Phase Representation of Frequency Response of LTI System: Linear phase, concept of phase delay and group delay. All pass system.

[TL, T2] [No. of Hrs. 11]

UNIT- IV
Sampling: Sampling of low pass signals, ideal sampling, Aliasing effect, Nyquist rate, reconstruction of signal. Sampling of discrete time signals.

[TL, T2] [No. of Hrs. 10]
Text Books:


Reference Books:


[R3] A. Anand Kumar, “signals and systems” 3rd edition, PHI


### ANALOG ELECTRONICS-I LAB

**Paper Code:** ETEC-251  
**Paper:** Analog Electronics-I Lab  
**L T/P C** 0 2 1

**List of Experiments:**

1. Plotting input and output characteristics and calculation of parameters of a transistor in common emitter configuration.

2. Transistor biasing circuit. Measurement of operating point (Ic and Vce) for a :-
   i. fixed bias circuit
   ii. Potential divider biasing circuit.

3. Plot the FET characteristics & MOSFET characteristics.

4. Two Stage R.C. Coupled Amplifier.
   i. To measure the overall gain of two stages at 1 KHz and compare it with gain of Ist stage,  
      Also to observe the loading effect of second stage on the first stage.
   ii. To plot the frequency response curve of two stage amplifier.

5. To study Emitter follower circuit & measurement of voltage gain and plotting of frequency response curve.

6. Feedback in Amplifier. Single stage amplifier with and without bypass capacitor. Measurement of voltage gain and plotting the frequency response in both cases.

7. To determine and plot firing characteristics of SCR by varying anode to cathode voltage, and varying gate current.

8. To note the wave shapes and voltages at various points of a UJT relaxation oscillator circuit.

9. Transistorized push pull amplifier & Measurement of optimum load, maximum undistorted power (by giving maximum allowable signal) Efficiency and percentage distortion factor.

10. To study the characteristics of single tuned & double tuned amplifier.

**Note:** It is advised to use PSPICE software and the hardware design for performing and evaluation of the above circuits.

**NOTE:** - At least 8 Experiments out of the list must be done in the semester.
SWITCHING THEORY AND LOGIC DESIGN LAB

Paper Code: ETEC-253  
Paper: Switching Theory and Logic Design Lab

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<thead>
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<th>L</th>
<th>T/P</th>
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List of Experiments:

1. Realize all gates using NAND & NOR gates
2. Realize Half Adder, Full Adder, Half subtracter, Full subtracter
3. Realize a BCD adder
4. Realize a Serial Adder
5. Realize a four bit ALU
6. Realize Master-Save J K Flip-Flop, using NAND/NOR gates
7. Realize Universal Shift Register
8. Realize Self-Starting, Self Correcting Ring Counter
9. Realize Multiplexer and De-Multiplexer
10. Realize Carry Look ahead Adder / Priority Encoder
11. Simulation of PAL and PLA
12. Simulation Mealy and Moore State machines

NOTE: - At least 8 Experiments out of the list must be done in the semester
### ELECTRONIC INSTRUMENTS AND MEASUREMENTS LAB

**Paper Code:** ETEC - 257  
**Paper:** Electronic Instruments and Measurements Lab  
**L**  
**T/P**  
**C**

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**List of Experiments**

1. Study and demonstration of different types of display devices.
6. Study and demonstration of universal frequency counter.
7. Study and measurement of voltage, frequency and phase difference of a.c. quantities using C.R.O.
8. Measurement of inductance and capacitance using C.R.O.
9. Study and measurement of quantities using D.S.O.
10. Study of function generator.
11. Study and use of different types of transducers.
12. Study of different types of recorders / Printers.
13. To study and use different types of ADC and DAC.
14. To study functioning and applications of Wave Analyzer.

**NOTE:** At least 8 Experiments out of the list must be done in the semester
DATA STRUCTURES LAB

Paper Code: ETCS-255
Paper: Data Structures Lab

List of Experiments:

1. Perform Linear Search and Binary Search on an array.
   Description of programs:
   a. Read an array of type integer.
   b. Input element from user for searching.
   c. Search the element by passing the array to a function and then returning the position of the element
      from the function else return -1 if the element is not found.
   d. Display the position where the element has been found.
2. Implement sparse matrix using array.
   Description of program:
   a. Read a 2D array from the user.
   b. Store it in the sparse matrix form, use array of structures.
   c. Print the final array.
3. Create a linked list with nodes having information about a student and perform
   I. Insert a new node at specified position.
   II. Delete of a node with the roll number of student specified.
   III. Reversal of that linked list.
4. Create doubly linked list with nodes having information about an employee and perform Insertion at front of
   doubly linked list and perform deletion at end of that doubly linked list.
5. Create circular linked list having information about an college and perform Insertion at front perform Deletion
   at end.
6. Create a stack and perform Pop, Push, Traverse operations on the stack using Linear Linked list.
7. Create a Linear Queue using Linked List and implement different operations such as Insert, Delete, and
   Display the queue elements.
8. Create a Binary Tree (Display using Graphics) perform Tree traversals (Preorder, Postorder, Inorder) using the
   concept of recursion.
9. Implement insertion, deletion and display (inorder, preorder and postorder) on binary search tree with the
   information in the tree about the details of a automobile (type, company, year of make).
10. To implement Insertion sort, Merge sort, Quick sort, Bubble sort, Bucket sort, Radix sort, Shell sort,
    Selection sort, Heap sort and Exchange sort using array as a data structure.

NOTE:- At least 8 Experiments out of the list must be done in the semester.
## Signals and Systems Lab

**Paper Code:** ETEC-259  
**Paper:** Signals and Systems Lab  
**L T/P C**

<table>
<thead>
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<th>List of experiments</th>
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<tbody>
<tr>
<td>1. Introduction to MATLAB and its basic commands.</td>
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<td>2. Plot unit step, unit impulse, unit ramp, exponential, parabolic functions and sinusoidal signals</td>
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<td>3. Plot the linear convolution of two sequences.</td>
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<td>4. Plot the correlation of two sequences.</td>
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<td>5. Plot the magnitude and phase spectra of a signal using Fourier transforms.</td>
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<tr>
<td>6. Plot the magnitude and phase spectrum of signal using Fourier series.</td>
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<td>7. Find out the Z transform of a signal and check the stability using pole zero location.</td>
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<tr>
<td>8. Plot the spectrum of ideally sampled signal w.r.t. sampling of Discrete time signals.</td>
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<tr>
<td>9. Verification of few properties of Fourier transform.</td>
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<td>10. Evaluate the DTFS coefficients of a signal and plot them.</td>
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<td>11. Plot the step response for any impulse response entered by user.</td>
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**NOTE:** At least 8 Experiments out of the list must be done in the semester