

**COMMON POOL OF GENERIC ELECTIVES (GE) COURSES OFFERED BY THE DEPARTMENT**

**GENERIC ELECTIVES (GE-1)**

**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Instrumentation	4	3	-	1	Class XII passed with Maths/Applied Maths	Idea about basic circuit elements like R, C and L, Ammeter, Voltmeter

**Learning Objectives**

The Learning Objectives of this course are as follows:

- Explain the importance and working principle of different electronic measuring instruments.
- Use the complete knowledge of various instruments and transducers to make measurements in the laboratory.

**Learning outcomes**

The Learning Outcomes of this course are as follows:

- Familiarize with the working principle of different measuring instruments
- Understand measuring instruments used in the laboratory like oscilloscopes, signal generators
- Understand working principle of transducers
- Familiarize with the working principle of data acquisition devices and biomedical instruments.

**SYLLABUS OF ELGE-4A**

**Total Hours- Theory: 45 Hours, Practicals: 30 Hours**

### **UNIT – I ( 10 Hours)**

**DC and AC indicating Instruments:** Accuracy and precision, Types of errors, PMMC galvanometer, sensitivity, Loading effect , Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter, Multimeter.

### **UNIT – II (12 Hours)**

**Oscilloscopes:** CRT, wave form display and electrostatic focusing, time base and sweep synchronisation, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Dual trace oscilloscope, DSO :Block diagram, principle and working, Advantages and applications, CRO specifications (bandwidth, sensitivity, risetime).

**Signal Generators:** Function generators.

### **UNIT – III (10 Hours)**

**Transducers:** Basic requirements of transducers, Transducers for measurement of nonelectrical quantities: Types and their principle of working , measurement of Linear displacement, Acceleration, Flow rate, Liquid level, strain, Force, Pressure, Temperature.

### **UNIT – IV (13 Hours)**

**Data acquisition systems:** Block diagram, brief description of preamplifier, signal conditioner, instrumentation amplifier, A/D and D/A converter blocks, computer-controlled test and measurement system.

**Bio-medical instrumentation:** Bio-Amplifiers: Different types of Bio-OP-Amps, Electrodes for ECG , block diagram of ECG system, brief analysis of graphs.

### **Practical component (if any) – Instrumentation (Hardware and Circuit Simulation Software)**

#### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- To measure various electrical parameters.
- To measure characteristics of various sensors and transducers.
- Understand ECG pattern.
- Prepare the technical report on the experiments carried.

#### **LIST OF PRACTICALS ( Total Practical Hours – 30 Hours)**

1. Design of ammeter and voltmeter using galvanometer.
2. To determine the Characteristics of resistance transducer - Strain Gauge
3. To determine the Characteristics of LVDT.
4. To determine the Characteristics of Thermistors and RTD.
5. Measurement of temperature by Thermocouples and study of transducers like AD590 (two terminal temperature sensor), PT-100, J- type, K-type.

6. Characterization of bio potential amplifier for ECG signals.
7. Measurement of heart sound using electronic stethoscope. Study on ECG heart rate monitor /simulator
8. Study of pulse rate monitor with alarm system.

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than seven.

#### **Essential/recommended readings**

1. Electrical and Electronics Measurement and Instrumentation Sahwany A.K.
2. Handbook of biomedical instrumentation: Khandpur R S, TMH
3. Electron measurements and instrumentation techniques: Cooper W D and Helfric A D, PHI, 1989.
4. Biomedical instrumentation and measurements: Leslie-Cromwell, Fred J Weibell, Erich A Pfeiffer, PHI, 1994.
5. Mechatronics – principles and applications, Godfrey C Onwubolu, Elsevier, 2006

#### **Suggestive readings**

1. Electrical Measurement in Measuring Instruments. Goldwing E.W. and Widdies
2. Measurement systems applications and design: Doeblin E O, McGraw Hill, 1990.
3. Instrumentation devices and systems: Rangan, Sarma, Mani, TMH
4. Instrumentation measurement and analysis: Nakra B C, Chaudry K K, TMH

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

## GENERIC ELECTIVES (GE-2)

### CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
<b>Mobile Application Development</b>	<b>4</b>	<b>1</b>	<b>-</b>	<b>3</b>	<b>Class XII passed in any stream</b>	<b>Idea about the Computer System Configuration like processor, RAM, ROM, different Operating Systems etc.</b>

#### Learning Objectives

In this course, student will be developing foundational programming skills to support graphical element presentation and data manipulation from basic functions through to advance processing. You will continue to build your skill set to use and apply core graphics, touch handling and gestures, animations and transitions, alerts and actions as well as advanced algorithms, threading and more. By the end of this course, you will be able to develop a more advanced, fully functioning app. currently this course is taught using Flutter UI SDK.

#### Learning outcomes

The Learning Outcomes of this course are as follows:

- Explain the concepts on: Elements of user interface, Model-View-Controller architecture, Data persistence and storage, Multithreading, Mobile web vs. mobile app, Services, broadcasts and notifications, Sensor management and location-based services.
- Describe different mobile application models/architectures and patterns.
- Familiarize with data type, data operators, exception handling and file management
- Describe the components and structure of a mobile development framework (Flutter SDK) in the development of a mobile application

#### SYLLABUS OF ELGE-4B

**Total Hours- Theory: 15 Hours, Practicals: 90 Hours**

#### UNIT – I

**Introduction:** What is mobile Application Programming, Different Platforms, Architecture and working of Android, iOS and Windows phone 8 operating system, Comparison of Android, iOS and Windows phone 8.

**About Flutter:** Understanding Flutter, Flutter framework, Introduction to Android studio, Flutter SDK - Installing and Configuring, Introduction to Dart writing Dart code, Dart Pad, Installing Dart SDK.

## **UNIT – II**

**Basic DART Programming Concepts:** Introduction, Main () function, Dart variables, Dart Data Types, Dart Conditional Operators: - if- Else statements, Loop operators, Break statements, switch case statements.

**Dart Functions & Object -Oriented Programming:** Functions- its structure, creating a function, function Return Data Types, Void function, variable scope, OOP- Objects and classes, creating a Class, Adding Methods to classes, Providing constructors for classes, Class – Getters and Setters, Class Inheritance, Abstract Class, Dart Project Structure and Dart Libraries.

## **UNIT – III**

**Flutter Widgets Fundamentals:** Scaffold, Image, Container, Column and Row, Icon Widgets, Layouts, Card Widgets, App Icon for iOS and Android apps, Hot reload and Hot Restart, Stateful and Stateless Widgets, Using custom Font.

**Navigation and Routing:** Button, Floating Action Button

**Visual, Behavioral and Motion-** Rich Widgets Implementation: Bottom Navigation Bar, ListTile, ListView, Drawer, DataTable, Selectable Text, Stack, Input and Selections, Text field, Checkbox group and Radio Button, Date Picker, Time Picker, Slider, Switch, Dialogs, Alerts and Panels.

## **UNIT – IV**

**App testing & Publishing:** Testing and feedback for your App, setting up a test environment, Usability Testing, starting your Test Session, Analyzing your Test, Publishing Flutter Apps, Publishing Android App on Google Play store.

Understanding Flutter Versions, Flutter macOS Setup, macOS development Environment, Publishing iOS app on Apple store.

**Practical component (if any) – Mobile Application Development  
(Flutter and Dart Software)**

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- Proficient in use of IDE's for designing and development of various android based applications.
- Design and developed various applications using various components GUI component, GPS, SD card.
- Prepare the technical report on the projects carried

**LIST OF PRACTICALS ( Total Practical Hours- 90 Hours)**

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Implement an application that implements multi-threading.
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock.
11. Develop an application for working with Menus and Screen Navigation.
12. Develop an application for working with Notifications

**List of Projects: -**

1. Counter App
2. Calculator App
3. Audio recorder App
4. Voice to text Converter
5. Tic-tac-toe Game

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than eleven and Projects less than four.

**Essential/recommended readings**

1. Flutter for Beginners: A Genius guide to flutter App development, Edward Thornton.
2. Beginning App Development with Flutter Book, Rap Payne.
3. Quick Start Guide to Dart Programming, Sanjib Sinha, Apress Publication.
4. Dart Apprentice: Beginning Programming with Dart, Jonathan Sande and Matt Galloway.

**Suggestive readings**

1. Flutter Complete Reference: Create beautiful, fast and native apps for any device, Alberto Miola.
2. Beginning Flutter: A Hands-on Guide to App Development, Marco L. Napoli.

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.