UNIVERSITY OF MUMBAI

No. UG/ 8 of 2018-19

CIRCULAR:-

Attention of the Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office Circular Nos. UG/264 of 2017-18, dated 23rd October, 2017, UG/287 of 2017-18, dated 30th October, 2017and UG/263 of 2017-18, dated 23rd October, 2017 relating to syllabus of the Bachelor of Science (B.Sc.) degree course.

They are hereby informed that the recommendations made by the Board of Studies in Physics at its meeting held on 23rd April, 2018 have been accepted by the Academic Council at its meeting held on 5th May, 2018 **vide** item No. 4.26 and that in accordance therewith, the revised syllabus as per the (CBCS) for the T.Y.B.Sc. in Physics including Applied Component - Electronic Instrumentation (EI) & Computer Course (CS) (Sem -V & VI), has been brought into force with effect from the academic year 2018-19, accordingly. (The same is available on the University's website www.mu.ac.in).

(Dr. Dinesh Kamble)
I/c REGISTRAR

MUMBAI – 400 032
12th June, 2018

To

The Principals of the affiliated Colleges & Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C/4.26/05/05/2018

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No. UG/ 8 -A of 2018 MUMBAI-400 032 12th June, 2018

Copy forwarded with Compliments for information to:-

1) The I/c Dean, Faculty of Science & Technology,
2) The Chairman, Board of Studies in Physics,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Co-Ordinator, University Computerization Centre,

(Dr. Dinesh Kamble)
I/c REGISTRAR

UNIVERSITY OF MUMBAI

No. UG/ 8 of 2018-19

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(Dr. Dinesh Kamble)
I/c REGISTRAR

UNIVERSITY OF MUMBAI

Syllabus for Sem V & VI Program: B.Sc.

Course: Electronic Instrumentation

(Applied Component)

(Credit Based Semester and Grading System with effect from the academic year 2018 –2019)

SEMESTER V			
Theory			
USACEI501	**Analog Circuits, Instruments and Consumer Appliances.**	**No. of Credits**	**Lectures/Week**
Unit I	Transducers, Sensors and Optoelectronics Devices	02	04
Unit II	Signal conditioning, SMPS and Measuring Instruments		
Unit III	Data Acquisition and Conversion		
Unit IV	Modern Techniques and Consumer Appliances		
Practicals			
USACEI5P1	**Analog Circuits, Instruments and Consumer Appliances.**	02	04

SEMESTER VI			
Theory			
USACEI601	**Digital Electronics, Microprocessor, Microcontroller and OOP.**	**No. of Credits**	**Lectures/Week**
Unit I	Digital Electronics.	02	04
Unit II	Advanced 8085 Programming and 8255 (PPI) interfacing.		
Unit III	Introduction to Microcontrollers.		
Unit IV	Basic Concepts of Object Oriented Programming and C++.		
Practicals			
USACEI6P1	**Digital Electronics, Microprocessor, Microcontroller and OOP.**	02	04

The revised syllabus under the credit based grading system in the subject of **Electronic Instrumentation** (Applied Component) for Third Year B.Sc. Physics (Single/Twin major subject) will be implemented **from the academic Year 2018-19**

The scheme of examination in the subject of Electronic Instrumentation (Applied Component) will be as follows:

Semester V & VI: Theory

Course Code: USACEI501 & USAEI601

Theory Examination: 100 marks

- Duration of each Theory paper will be of **three** hours.
- Each theory paper shall consist of **five questions**, one from each unit and the fifth question will be from all the units. All questions are compulsory and will have internal choice.
- The theory examination will be conducted by the respective colleges and the marks will be forwarded to the University

Objectives

The objective of these papers is to introduce the students to sensors and transducers, Signal conditioning, data acquisition systems and measuring instruments used in the laboratory. Students are to be exposed to know, in principle, the modern techniques in the field of medical science. To learn PCB designing and working of consumer electronic devices. To develop logic circuit design and implementation. To know advanced programming skills and interfacing techniques. To understand basic building blocks of microcontrollers. To know the terminologies like embedded, CISK and RISK processors. To master Programming and interfacing skills of microprocessor and microcontrollers. To develop object oriented programming skills and programming in C++. To develop various experimental skills.

Expected learning outcomes

Learner will be able to:

- Understand the difference between a transducer and a sensor.
- Understand the construction, working and uses of different types of transducers.
- Understand the concept of signal conditioning, devices used and their operations.
- Get acquainted with the measuring instruments used in laboratory.
- Get the insight of the modern medical instruments in principle, which are used in day to day life.
- Analyze/design and implement combinational logic circuits.
- Develop assembly language programing skills and real time applications of microprocessor.
- Illustrate how to interface the I/O peripheral (PPI) with 8085 microprocessor
- Understand architecture, silent features, instruction set, programming and interfacing of 8051 microcontroller.
- Develop the programming skills in programming Language C++.
- Train their practical knowledge through lab experiments.
- Get practical training to interface different programmable peripherals and I/O devices to microprocessor and microcontroller.

Semester V & VI: Practical

Course Code: USACEI5P1 & USACEI6P1

The practical examination will be conducted as per the following scheme by the respective colleges and the marks will be forwarded to the University:

Sr. No	**Particulars of External Practical Examination**	**Marks**
1	Laboratory Work	80
2	Journal	10
3	Viva	10
	TOTAL	**100**

Total Marks in each semester: **100 Marks**

- Duration of each Practical paper will be of 3 Hours per semester.
- A certified Journal of Electronic Instrumentation must contain a minimum of **EIGHT** Experiments in each semester. At least TWO experiments from each sub groups, as mentioned in the syllabus, should be performed and reported in journal.
- Every candidate will be required to perform ONE experiment (from sub groups A or B or C or D) at the semester end practical examination.
- A candidate will be allowed to appear for the Practical Examination only if the candidate submits his/her certified Journal or a certificate from the Head of the Department of Physics stating that the candidate has completed the practical Course of Electronic Instrumentation of the respective semester as per requirements.

SEMESTER V

COURSE CODE: USACEI501

ANALOG CIRCUITS, INSTRUMENTS AND CONSUMER APPLIANCES.

Unit- I:	**Transducers, Sensors and Optoelectronic Devices**	(15 lect.)
1.	**Transducers:** Definition, Classification, Selection of transducer.	
2.	**Electrical transducers:** Thermistor, Thermocouple, Pressure Transducer: Strain gauges (wire, foil, & semiconductor), Displacement transducer: LVDT, Peizo-electric Transducer. [Ref. 2, 3, 6 & 9]	
3.	**Chemical sensors:** PH sensor, Gas sensor (Fundamental aspects), Humidity sensor (Resistive). [R6, R7].	
4.	**Electronic Weighing Systems:** Operating principle, Block diagram, features [Ref12 & 13].	
5.	**Optoelectronic Devices:** LDR, LED (Construction, Working & Applications), Multicolour LED, Seven Segment Display, Liquid Crystal Display (LCD), Photodiode (construction, Characteristics & applications), Phototransistor. [Ref. 1, 2 & 3]	
Unit-II:	**Signal Conditioning, SMPS and Measuring Instruments**	(15 lect.)
1.	Half wave precision rectifier, Active Peak detector, Active Positive Clamper [M & B].	
2.	Active Positive and Negative Clippers [G]	
3.	**Microphones:** characteristics, types (list only), carbon microphone and dynamic type microphone (principle, construction and working) [R4].	
4.	**Loud speakers:** Characteristics, Dynamic (Moving coil type) speaker, Multi-way speaker system (woofer and tweeter) [R4]	
5.	**Switching Regulators:** Basic and Monolithic Switching regulators (buck, boost and buck – boost) (Only basic Configurations) Ref M: 24.7	

6.	**Cathode Ray Oscilloscope:** Single trace CRO (Block diagram), Front Panel Controls (Intensity, Focus, Astigmatism, X & Y position, Level knob, Time base (Time/Division) and attenuation (Volts/Division) knobs, X-Y mode), Dual Trace CRO (Block diagram), Probes: 1:1&10:1. Digital Storage Oscilloscope [R3 &10].	
7.	**DMM:** 3 ½ Digit, resolution and sensitivity, general specification. [R3]	
Unit- III:	**Data Acquisition and Conversion**	(15 lect.)
1.	**Data acquisition system:** Objectives of DAS, Signal conditioning of inputs, Single channel Data Acquisition system, Multichannel Data Acquisition system. [Data Transmission systems IEEE-488 GPIB*] [Ref. 11]	
2.	**D to A Converters:** Resistive divider network, Binary ladder network [Ref 7 & 8]	
3.	**A to D Converters:** Successive approximation type, Voltage to Time (Single slope, Dual slope). [Ref. 7 & 8]	
Unit-IV:	**Modern Techniques and Appliances**	(15 lect.)
1.	**Printed Circuit Board:** Idea of PCB, advantages, copper clad, Etching processes, Principle of Photolithography (For PCB). [Ref. 4, 14 & 15].	
2.	**Microwave Oven:** Operating principle, block diagram, features. [Ref. 12 & 13]	
3.	**Medical instruments:** Bio-Potential, Types of electrodes, ECG, EEG, EMG, CT Scan and MRI (principle, block diagram and features), Ultrasonography: working principle [R 16, 17 and18].	

References:

1.	A Textbook of Applied Electronics – R S Sedha, S Chand & Company, New Delhi.
2.	Basic Electronics Solid state - B. L. Thereja, S Chand & Company, New Delhi.
3.	Electronic Instrumentation – H S Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4.	Electronic components and materials: Principles, Manufacture and Maintenance- S. M. Dhir, Tata McGraw-Hill Publishing Company Limited, New Delhi.

	https://books.google.co.in/books?id=sGbwj4J76tEC&pg=PA384&lpg=PA384&dq=4.+Electronic+components+and+materials:+Principles,+Manufacture+and+Maintenance-+S.+M.+Dhir,+Tata+McGraw-Hill+Publishing+Company+Limited,+New+Delhi.&source=bl&ots=U1ekaiN3pB&sig=viKj6soAvVom4Hx9W-53Q-koqFM&hl=en&sa=X&ved=0ahUKEwjCq97viYXaAhUEPo8KHfMNBaQQ6AEIMjAC#v=onepage&q=4.%20Electronic%20components%20and%20materials%3A%20Principles%2C%20Manufacture%20and%20Maintenance-%20S.%20M.%20Dhir%2C%20Tata%20McGraw-Hill%20Publishing%20Company%20Limited%2C%20New%20Delhi.&f=false. https://books.google.co.in/books?id=bftp5ZG8v5kC&pg=PP1&lpg=PP1&dq=digital+Electronics+-+by+A.P+Godse+%26+D.A+Godse+Technical+publications,+Pune,+Revised+third+edition,+2008&source=bl&ots=_ApVT8Km_H&sig=hfrgOdJHfzdZwEy1_JPogAeRhLE&hl=en&sa=X&ved=0ahUKEwif3ZbKssraAhVFPI8KHVaJBKIQ6AEINTAB#v=onepage&q=digital%20Electronics%20-%20by%20A.P%20Godse%20%26%20D.A%20Godse%20Technical%20publications%2C%20Pune%2C%20Revised%20third%20edition%2C%202008&f=false
5.	Measurement and Instrumentation Principles: Alan S. Morris., Butterworth-Heinemann.
6.	Transducers and display systems: B. S. Sonde, Tata McGraw-Hill Publishing Company Limited, New Delhi.
7.	Digital principles and applications: A.P. Malvino and D. P. Leach. Tata McGraw-Hill.
8.	Data Converters– B. S. Sonde, Tata McGraw-Hill Publishing Company Limited, New Delhi.
9.	Modern Electronic Instruments and Measurement techniques- Albert D. Helfrick, Willam D. Cooper, Prentice Hall India Pvt. Ltd, New Delhi.
10.	A course in electrical and electronic Measurements and Instrumentation: A. K. Sawhney, DhanpatRai and Sons. https://www.scribd.com/document/258017718/A-K-sawhney-A-Course-in-Electrical-and-Electronic-Measurements-and-Instrumentation
11.	Instrumentation Devices & Systems , 2nd Edition Tata McGrawHill- C.S. Rangan, G.R. Sarma,V.S. Mani
12.	Consumer Electronics R. P. Bali, Pearson Education (2008)

13.	S.P Bali, "Consumer Electronics", Pearson Education Asia Pvt., Ltd., 2008 Edition,
14.	Printed Circuits Handbook pdf, Clyde F. Coombs. Jr. , McGraw Hill Handbooks, 6th ed.
15.	PCB design basics, Mahmoud Wahby, EDN Networks, Nov 2013.
16.	Introduction to Bio-medical Electronics: Joseph-Du-bary, McGraw Hill Co. Ltd.
17.	Medical instrumentation Application and design- J. C. Wobster
18.	Biomedical instruments and measurements – L. Cromwell, F. J. Weibell, Printice hall of India of India Pvt. Ltd, New Delhi.

PRACTICALS (Semester V)

Course Code: USACEI5P1

1. Perform Minimum TWO Experiments from each group.
2. **Group C** experiments must be performed on Bread Boards.

GROUP - A	
Sr. No.	**Name of the Experiments**
1	Thermistor Characteristics –Thermal and electrical. (H & C)
2	Thermistor as sensor in temperature to voltage converter using OPAMP. (C&D Ch.8)
3	Study of LVDT characteristics. (K Ch. 13)
4	Study of Load Cell / Strain Guage. (K Ch. 13)
5	Study of seven segment display.
6	Characteristics of Photo diode and photo transistors.

GROUP - B	
Sr. No.	**Name of the Experiments**
1	Basic Instrumentation Amplifier using 3 Op-Amps coupled to resistance bridge. (C & D Ch. 8)
2	Temperature to frequency Conversion using 555 timer. (C & D Ch.13)
3	OPAMP D/A Converter: Binary weighted resistors.
4	OPAMP D/A Converter: Ladder network. (M & L Ch. 12)
5	Sample and hold circuit using op-amp 741. (G Ch. 8)
6	Peak detector using op-amp 741. (G Ch. 8)

GROUP – C (Must be performed on Bread Board)	
Sr. No.	**Name of the Experiments**
1	Half wave precision rectifier using precision op-amps (OPA177) (C & D Ch. 7)
2	Positive and Negative Clippers using op-amp.(G Ch. 8)
3	Positive and Negative Clampers using single power supply op-amp (124/324). (G Ch. 8)
4	Second Order active Low Pass filter (frequency response & phase relation)
5	Second Order active High Pass filter (frequency response & phase relation) (K.Ch15)
6	Active Notch Filter (frequency response & phase relation) (K.Ch.15)
7	Square and Triangular wave generator using OPAMPs with concept of duty cycle (M.Ch 23)

GROUP - D	
Sr. No.	**Name of the Experiments**
1.	Study of variable dual power supply using LM 317& LM 337 (± 3v to ± 15v). (C&D Ch.13)
2.	Constant Current source using OPAMP and PNP transistor (o/p current less than 50 mA) (C & D Ch 5)
3.	Simple microphone amplifier using a transistor.
4.	Low voltage audio amplifier using IC LM386
5.	Construction of Audio power amplifier using IC TBA 810.
6.	Making PCB for simple circuits (like rectifiers, regulators, oscillators, multivibrators, op-amp applications, single stage amplifier etc.), building and testing of the circuit.
7.	Visit to Hospital/Diagnostic Center/ Bio-medical Research Laboratory and submission of its report.

- Experiment No. 5 & 6 are Hands-on experiments. Learner have to prepare report, PPT and viva voice. Which is equivalent to 2 regular experiments.
- Visit to Hospital/Diagnostic Center/ Bio-medical Research Laboratory and submission of its report which is also equivalent to 2 regular experiments.
- Learner will be examined for Expt. No. 5, 6 and 7 on the basis of submitted report, PPT and viva, and need not perform regular experiment during the Practical Examination.

References:

1.	H & C: Modern Electronic Instrumentation & Measurement Techniques by Albert D. Helfrick & William D. Cooper PHI) Edition.
2.	C & D: OPAMPs and linear integrated circuits" by Coughlin & F. F. Driscoll (6th edition PHI)
3.	G: OPAMPs and linear integrated circuits by R.A. Gayakwad (4th edition, PHI).
4.	M: Electronic Principles by A. P. Malvino, (PHI), 6th edition.

5.	K: Electronic Instrumentation by H. S. Kalsi, (TMH) 2nd Edition
6.	M & L: Digital Principle and Applications" by Malvino and Leach, (TMH), 5th edition,
7.	RPJ: Modern Digital Electronics, R .P. Jain, (TMH), 3rd edition.

SEMESTER VI

COURSE CODE: USACEI602

DIGITAL ELECTRONICS, MICROPROCESSOR, MICROCONTROLLER AND OOP

Unit- I:	**Digital Electronics**	(15 lect.)
1.	**Combinational Logic Design:** Introduction, Boolean identities, K – map (2, 3 and 4 variable), **Ref: N G P 4.1 – 4.8.** (additional ref. RPJ)	
2.	**Design and implementations of:** Decoders, Encoders, Multiplexers, De-multiplexers, Use of MUX and DEMUX in Combinational Logic design. Code Converters (based on – binary, BCD, Gray and Excess – 3 codes). Tri-State logic, buffers, D latch.	
	Ref: N G P - 5.1 (only introduction), 5.3, 7.1 -7.6 (except 7.5) RPJ - 4.20. RG: 3.5.1, 3.5.2, 3.5.3, 3.5.4 & 3.5.5 NGP: Digital Electronics and Logic design by N G PALAN, https://archive.org/details/hellomr82k_gmail_DE RG: Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, 5th Edition. RPJ: R. P. Jain, Modern Digital Electronics, Tata McGraw Hill, 4th Edition.	

Unit-II:	**Advanced 8085 Programming and 8255(PPI)**	(15 lect.)
1.	Introduction to advanced instructions and applications Ref. RG: 10.7, 10.8, 10.9	
2.	Stack and Subroutines**:** Stack, Subroutine Ref. RG: 9.1, 9.1.1, 9.2&9.2.1	
3.	The 8255 Programmable Peripheral Interface: Block Diagram of the 8255, Mode 0 – Simple Input / Output mode, BSR (Bit Set/Reset Mode) Ref. RG: 15.1.1, 15.1.2& 15.1.3	
	RG: Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, 5th Edition.	
Unit- III:	**Introduction to Microcontrollers**	(15 lect.)
1.	Introduction, Microcontrollers and Microprocessors, History of Microcontrollers and Microprocessors, Block diagram of 8051 Microcontroller*, Embedded Versus External Memory Devices, 8-bit & 16-bit Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Commercial Microcontrollers. Ref. AVD-Ch: 1 Ref. MMM - For * Refer 1.2 The 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidiand R. D. Mckinlay, Second Edition, Pearson.	
2.	**8051 Microcontrollers:** Introduction, MCS-Architecture, Registers in MCS-51, 8051 Pin Description, 8051 Connections, 8051 Parallel I/O Ports, Memory Organization. AVD-Ch: 2, 3.	
3.	**8051 Instruction Set and Programming:** *MCS-51 Addressing Modes and Instructions***:** 8051 Addressing modes, MCS-51 Instruction Set, 8051 Instructions and Simple Programs, Using Stack Pointer AVD-Ch: 4 Ref. AVD: Microcontrollers (Theory and Applications) by Ajay V Deshmukh, The Tata-McGraw-Hill Companies **Ref. Intel's 8031/8051 Data sheet**	

	https://archive.org/details/bitsavers_intel8051M4_15073500 https://www.8051projects.net/download-d215-intel-mcs-51-8051-user-manual.html https://archive.org/stream/212656146The8051MicrocontrollerByIScott Mackenzie4th Edition/212656146-The-8051-Microcontroller-by-I-Scott-Mackenzie-4th-Edition#page/n47/mode/2up Additional Reference books: 1. The 8051 Microcontroller & Embedded Systems-Dr. Rajiv Kapadia (Jaico Pub. House) 2. 8051 Micro-controller by K.J.Ayala., Penram International. 3. Programming & customizing the 8051 microcontroller By Myke Predko, TMH. 4. The 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidiand R.D.Mckinlay, Second Edition, Pearson.

Unit-IV:	**Basic Concepts of Object Oriented Programming and C++**	(15 lect.)
1.	**Basics of Object-Oriented Programming & Beginning with C++:** Basic concepts of Object-Oriented Programming, Benefits of OOP, Object-Oriented Languages, Applications of OOP. What is C++?, Applications of C++, A simple C++ program, More C++ Statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and Linking. Ref EB: 1.5, 1.6, 1.7 & 1.8 EB: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 & 2.8	
2.	**Tokens and Expressions in C++:** Introduction, Tokens, Keywords, Identifiers and Constants, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator, Expressions and Their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence. Ref EB: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21, 3.22 & 3.23	
3.	**Control Structures and Functions:** Control Structures, Functions: The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Default Arguments, Constant Arguments, Function Overloading, Math Library Functions.	

Ref EB: 3.24, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9 & 4.11

Reference:
EB: Object Oriented Programming with C++ by E Balagurusamy, Third /Fourth Edition, Tata McGraw-Hill Publishing Company Limited.

Additional references:

1) Microprocessor and Applications by Vibhute and Borole, Techmax Publications,
2) Microprocessor, Principles & Applications by Gilmore (2nd Ed) TMH
3) Programming with C++ by D. Ravichandran, Tata McGraw-Hill Publishing Company Limited.
4) Starting out with C++ by Tony Gaddis, Third Edition, Addison Wesley Publishing Company.
5) Digital Electronics - by A.P Godse & D.A Godse Technical publications, Pune, Revised third edition, 2008. Pg.No:2.25-2.70 (for K-maps).

https://www.scribd.com/document/103027386/Digital-Electronics-By-D-A-Godse-A-P-Godse

https://books.google.co.in/books?id=JkMrIjNKI7IC&pg=PP1&lpg=PP1&dq=Digital+Electronics+-+by+A.P+Godse+%26+D.A+Godse+Technical+publications,+Pune,+Revised+third+edition,+2008&source=bl&ots=9VG8scIgqH&sig=d7cyhWaM7cCwabgqRMoWz6snI8s&hl=en&sa=X&ved=0ahUKEwiv55-j6cbaAhUBvY8KHUZJBmMQ6AEIPTAD#v=onepage&q=Digital%20Electronics%20-%20by%20A.P%20Godse%20%26%20D.A%20Godse%20Technical%20publications%2C%20Pune%2C%20Revised%20third%20edition%2C%202008&f=false

PRACTICALS (Semester VI)

Course Code: USACEI6P1

Note: Perform Minimum TWO Experiments from each group.

GROUP – A: Digital Electronics	
Sr. No.	**Name of the Experiments**
1	Study of 3:8 Decoder (74LS138), 8:3 Priority Encoder (74LS148) and their applications.
2	Study of Latch (74LS373) and its application.
3	Study of 8:1 Multiplexer (74LS151), 1: 4 De-multiplexer (74LS155) and their applications.
4	Study of unidirectional buffer (74LS244) and bidirectional buffer (74LS245).
5	Design using K –map and implement 4:1 MUX, 1:4 DEMUX, 2bit comparator, Full adder and Full subtractor. [Note: Use suitable circuit simulator for implementation]
6	Designing (using K –map) and implementation of code convertors. (any two – Binary to Gray, Gray to Binary, BCD to Excess – 3 and Excess-3 to BCD) [Note: Use suitable circuit simulator for implementation]
GROUP – B : 8085 Advanced Programming and 8255 interfacing **Note:** The students should be familiar with Keyboard and Display utilities such as READ KEYBOARD, TO DISPLAY ON ADDRESS FIELD, and TO DISPLAY ON DATA FIELD, mentioned in the 8085 µp kit's manual.	
Sr. No.	**Name of the Experiments**
8085 programming	
1	Write An ALP: a) To Evaluate simple arithmetic Expression (like Y= a x b + c x d where a, b, c and d are 8-bit HEX numbers) b) To Add parity bit to 7-bit ASCII characters.

2	Write An ALP for code conversion (any two)
3	16-bit Data manipulation (Addition, subtraction) Display result on Address field.
4	Write ALP for Addition/ Subtraction/Multiplication of two, 8-bit hex, numbers. [**Note:** Use Read Keyboard Utility for inputting the hex numbers and display the result on the Address field.]
8255 interfacing	
1.	Design a system (both Software and Hardware) that will cause 4 LEDs to flash when a push button switch is pressed. Assume persistence of vision to be 0.1 seconds.
2.	Design a system (both Software and Hardware) using 8 LED display to demonstrate: a) Binary - up, down and ring counters. b) Flashing display.
3.	Design a system (both Software and Hardware) to control ON/OFF operation of 4 electrical loads (appliances).
4.	Interfacing 8 switches and 8 LEDs to 8255: a) Write ALP to read the status of the switches and display on the LEDs. b) Write ALP so that when the first switch is made ON all the LEDs should glow and when the second switch is made OFF all the LEDs should become off.
GROUP – C: Experiments for 8031 / 8051 / 89C51	
Sr. No.	**Name of the Experiments**
1	**8031/51 assembly language programming:** a) Simple data manipulation programs. (8/16-bit addition, subtraction, multiplication, division. b) 8/16 bit data transfer, cubes of nos., to rotate a 32- bit number c) Finding greatest/smallest number from a block of data, decimal / hexadecimal counter.

2	**Study of IN and OUT port of 8031/51 by Interfacing switches, LEDs and Relays:** a) To display bit pattern on LED's b) To count the number of "ON" switches and display on LED's, c) To trip a relay depending on the logic condition of switches d) Event counter (using LDR and light source)
GROUP – D: C++ Programming	
Sr. No.	**Name of the Experiments**
1.	Program based on Input, Output Statements. (Programs to read any two numbers through keyboard and to perform simple arithmetic operations and to display the result).
2.	Program based on Control Statements a) Program based on if-else statement b) Program based on nested if statement
3.	Program based on for loop, while loop and do-while loop.
4.	Program using switch statements and if-else ladder.
5.	Program to study function declaration, function calling and function prototype.