

Gondwana University, Gadchiroli

Choice Based Credit System (CBCS) Syllabus

M. Sc. I

Subject: Electronics

Semester-I & II

Board of Studies - Electronics

Gondwana University Gadchiroli

Scheme of Master of Science for CBCS Semester Examination

(W.e.f. 2016-17)

Appendix-1

Scheme of teaching and examination under semester pattern Choice Based Credit System

Semester-I for M. Sc. Program in Electronics											
Code	Theory/Practical	Teaching Scheme (Hours /Week)			Credit	Examination Scheme					
		Theory	Practical	Total		Duration in hrs	Max. Marks		Total Marks	Minimum Passing Marks	
							External Marks	Internal Assessment		Theory	Practical
Core-1	Paper-1	4	-	4	4	3	80	20	100	40	
Core-2	Paper-2	4	-	4	4	3	80	20	100	40	
Core-3	Paper-3	4	-	4	4	3	80	20	100	40	
Core-4	Paper-4	4	-	4	4	3	80	20	100	40	
Pract. Core-1 & 2	Practical-1	-	8	8	4	3-8*	80	20	100		40
Pract. Core-3 & 4	Practical-2	-	8	8	4	3-8*	80	20	100		40
Seminar	Seminar-1	2	-	2	1			25	25	10	
	Total	18	16	34	25		480	145	625	170	80

Semester-II for M. Sc. Program in Electronics											
Code	Theory/Practical	Teaching Scheme (Hours /Week)			Credit	Examination Scheme					
		Theory	Practical	Total		Duration in hrs	Max. Marks		Total Marks	Minimum Passing Marks	
							External Marks	Internal Assessment		Theory	Practical
Core-5	Paper-5	4	-	4	4	3	80	20	100	40	
Core-6	Paper-6	4	-	4	4	3	80	20	100	40	
Core-7	Paper-7	4	-	4	4	3	80	20	100	40	
Core-8	Paper-8	4	-	4	4	3	80	20	100	40	
Pract. Core-5&6	Practical-3	-	8	8	4	3-8*	80	20	100		40
Pract. Core-7&8	Practical-4	-	8	8	4	3-8*	80	20	100		40
Seminar	Seminar-2	2	-	2	1		-	25	25	10	
	Total	18	16	34	25		480	145	625	170	80

Syllabus

M. Sc. Electronics Semester-I

Code	Paper	Theory Marks	Internal Marks	Total Marks	Credits
PSCELET01	Fundamentals of Semiconductor Devices	80	20	100	4
PSCELET02	Digital Design and Applications	80	20	100	4
PSCELET03	Advanced Microprocessors	80	20	100	4
PSCELET04	Programming in C	80	20	100	4

Practicals

Code	Practical	Practical Marks	Internal Marks	Total Marks	Credits
PSCELEP01	Lab Course I- Analog and Digital Electronics Lab	80	20	100	4
PSCELEP02	Lab Course II- Computer Interfacing and Programming in C	80	20	100	4
PSCELES01	Seminar-1	25	--	25	1

Semester-II

Code	Paper	Theory	Internal	Total Marks	Credits
PSCELET05	Embedded Systems and Applications	80	20	100	4
PSCELET06	Biomedical Instrumentation	80	20	100	4
PSCELET07	Computer Organization and Interfacing	80	20	100	4
PSCELET08	Virtual Instrumentation	80	20	100	4

Practicals

Code	Practical	Practical Marks	Internal Marks	Total Marks	Credits
PSCELEP03	Lab Course III – Microcontroller and Interfacing	80	20	100	4
PSCELEP04	Lab Course IV- Virtual instrumentation and Programming in Lab VIEW	80	20	100	4
PSCELES02	Seminar-2	25	--	25	1

M. Sc. (Electronics)
Semester-I

Paper-I (PSCELET01): Fundamentals of Semiconductor Devices

Theory: 60L

Credit: 4

Unit-I: Semiconductors

Valence bond model of semiconductor- intrinsic and extrinsic semiconductors, the energy band model; p-n junction, depletion region and capacitance; the diode equation, I-V characteristics, temperature dependence, electrical breakdown in p-n junctions, Zener and avalanche breakdowns; IMPATT, TRAPATT, PIN diode

Unit-II: Bi-polar Junction Transistors

Transistor action, the Ebers-Moll equations, CB, CE, CC configurations and characteristics, high frequency performance of transistor, alpha and beta cut-off frequencies, microwave transistor, switching transistor

Unit-III: Unipolar Devices

Metal-semiconductor contacts, the Schottky effect, JFET and MESFET, device characteristics, MOSFET, basic characteristics, charge-coupled devices (CCD)

Unit-IV: Optoelectronic Devices

Photovoltaic effect, the p-n junction solar cell, I-V characteristics, photodetectors: photoconductor, photodiode, avalanche photodiode;

LEDs: radiative and non-radiative transitions; semiconductor LASERS, population inversion

Books:

1. Introduction to Semiconductor Materials and Devices: M. S. Tyagi, Wiley India Ltd, New Delhi
2. Physics of Semiconductor Devices: Shur, Prentice Hall India, New Delhi

References:

1. Physics of Semiconductor Devices: S. M. Sze, Wiley eastern Publ.
2. Solid State Electronic Devices: Ben G. Streetman

M. Sc. (Electronics)
Semester-I
Paper-II (PSCELET02): Digital Design and Applications

Theory: 60L

Credit: 4

Unit-I: Combinational Logic Design

Simplification of logic functions using K-maps, don't care conditions, realization of Boolean functions using two level NAND-NAND, NOR-NOR logic, multiplexers, decoders, ROM, PLA; Interfacing of logic families: open-collector, totem-pole and tri-state outputs, TTL-CMOS interfacing, CMOS-TTL interfacing, loading rules, fan-out

Unit-II: Analysis and Design of Sequential circuits:

State diagrams, characteristic equations of different flip-flops, conversion from one type to another type of flip flops, Mealy and Moore models, design of a sequence detector, minimization of states, design of counters with lockout prevention; Asynchronous sequential circuits; ripple counters, detection and removal of races and hazards

Unit-III: VHDL: Implementation of Logic circuits

Combinational: Half adder, full adder and subtractor, decoder, encoder, multiplexer, DEMUX, ALU, 4x4 keyboard encoder, multiplier, divider; Sequential: Finite state machines, Mealy and Moore, State assignments, linear feedback, shift registers

Unit-IV: VHDL Architecture

Architectures of ROM, PLA, PAL, CPLD (Xilinx/Altera), FPGA (Xilinx/ Altera)

Practicals:

1. Design of some combinational circuits using NAND and NOR gates
2. Design of circuits using multiplexers
3. Design of circuits using a decoder and gates
4. Design of circuits using PLA
5. Design of binary comparator circuit
6. Design of UP/DN synchronous counter using DFFs
7. Design of Ripple counter using TFFs
8. Design of sequence detector circuits
9. Design of pulse gulper circuit
10. Digital System Design Experiments based on CLPD kits
11. Digital System Design Experiments based on FPGA

Books:

1. Logic Design : Charles Roth, Jaico Publications, New Delhi
2. Digital Design : Morris Mano, Prentice Hall India, New Delhi
3. Digital Principles and Applications : A. P. Malvino, MGH
4. Digital System Design using VHDL: Charles H. Roth, Jaico Publishers, New Delhi
5. Fundamentals of Digital Logic with VHDL Design: Stephen Brown, TMH, New Delhi

References:

1. Modern Digital Electronics: R. P. Jain, Tata McGraw Hill, New Delhi
2. VHDL : Douglas Perry, Tata McGraw Hill, New Delhi
3. VHDL Primer: J. Bhaskar, Pearson Education, New Delhi

M. Sc. (Electronics)
Semester-I

Paper-III (PSCELET03): Advanced Microprocessors

Theory: 60L

Credit: 4

Unit-I: Microprocessor Architecture

Introduction to 16-bit microprocessors, 8086/8088 CPU architecture, memory segmentation, physical address generation, addressing modes, Instruction set: data transfer, arithmetic, logical, string manipulation, control transfer, unconditional branch, conditional branch, flag, processor control, 8087 coprocessor, data formats

Unit-II: Assembly Language Programming

Assembler organization, assembler directives and operators, Assembly language programs, MASM and DEBUG utility, stack structure, PUSH and POP instructions, subroutine, procedure and macros, timing and delays

Unit-III: Interfacing of Peripherals

Programmable peripheral interface 8255, internal architecture, control word register, operating modes; Timer/counter 8253/8254: functional block diagram, control word register, modes of operation, timing diagrams; keyboard interface/display controller 8279: internal architecture, 8279 commands, operating modes; programmable interrupt controller 8259A: architectural block diagram, command words

Unit-IV: Architectures of 80x86 processors

Protected mode memory addressing, protected virtual addressing mode (PVAM), architecture, special features and overview of 80286, 80386 and 80486, Pentium Pro processors, superscalar architecture, MMX (Multimedia Extension) and SIMD (Single Instruction Multiple Data) technology

Practicals: Atleast 10 experiments based on Assembly Language Programming on μ p 8086/8088 and Peripherals (8255, 8253 and 8279).

Books:

1. Advanced Microprocessors & Peripherals: A. K. Ray & Bhurchandi, TMH, New Delhi
2. Microprocessor based Systems: N. G. Palan, Tech-Max Publication, Pune
3. Assembly Language Programming: Peter Abel, PHI, New Delhi
4. 8086/8088 Family: Design, Programming and Interfacing: John Uffenbeck, Pearson Education
5. Intel Microprocessors 8086, 80286, 80386, 80486, Pentium Pro Programming and Interfacing: Barry and Brey, PHI, New Delhi

References:

1. Modern Digital Electronics: R. P. Jain, TMH, New Delhi
2. The 80x86 Family : Design, Programming and Interfacing: John Uffenbeck, Pearson Education

M. Sc. (Electronics)
Semester-I
Paper-IV (PSCELET04): Programming in C

Theory: 60L

Credit: 4

Unit-I: Data types

Basics of programming – algorithms, flow charts, pseudo codes; Structure of a C program, compilers, assembler, interpreters; C character set, constants, variables and keywords, types of constants and variables; type declaration and arithmetic instructions, Integer and float conversions; operators in C , hierarchy of operators, Input-Output statements in C (Formatted and Unformatted), tools for programming in C – data types, data storage, data access, operators, associativity of operators, operator precedence

Unit-II: Control structure

Decision control structures- if, if-else, nested if, nested if-else, else-if ladder, switch-case; Loop control structures –while, do-while, for loop, Break statement, Continue statement

Unit-III: Arrays, functions, Structures and Unions

Arrays and strings; One- dimensional, Two dimensional and multidimensional array, various string operations; Function definition and prototyping, types of functions, type of arguments, recursion, passing arrays to functions, passing structures to functions, storage class in C; Structure and union: structure variable, accessing structure member, arrays of structure, union, bit fields

Unit-IV: Pointers and file handling

Pointers: declaration of pointers, chain of pointers, pointer expression, pointer arrays, pointer to array, pointer to function; File handling- File opening modes, Text and Binary files, High level and Low level operations on files; pointers, file handling in C; hardware access using C program- serial and parallel port; limitations of C programming

Practicals:

Minimum 10 practicals covering file handling for various data types, sorting and searching, printer port access for input-output, serial port access, interfacing of character display (5x7)

Books:

1. C Programming - C. Balaguruswamy, TMH, New Delhi
2. Let Us C: YashwantKanetkar, BPB Publications, New Delhi
3. C Programming: Gottfried, Schaum Outline Series, MGH
4. Programming Languages: Concepts and Constructs: Ravi Sethi, Addison Wesley Publishers

Reference:

1. The ANSI 'C' Language: Kernighan and Ritchie, PHI, New Delhi, 1996

M. Sc. (Electronics)
Semester-II
Paper I (PSCELET05): Embedded Systems and Applications

Theory: 60L

Credit: 4

Unit-I: Microcontrollers

Introduction to embedded systems, classifications, processor in the system, microcontroller, introduction: 8051 architecture, features of 8051, basic assembly language programming concepts, instruction set, data transfer, logical operations, arithmetic operations, jump/call instructions, interrupt handler, addressing modes, an 8051 microcontroller design & testing

Unit-II: Interfacing

Interfacing of Keyboard, displays, ADC/DAC, stepper motor, dc motor; serial communication with PC using RS232, Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I²C), serial communication with other microcontrollers/devices using I²C, SPI, RS232 and USB

Unit-III: Other Microcontrollers

Introduction to 16-bit micro-controllers, ATMEGA, PIC and ARM processors: General architecture and their limitations, clocking unit, Real Time Clock and Timers, Reset Circuitry and Watchdog Timer; development tools: ATMEL assembler and simulator, ATMEL AVR studio; robotic control applications

Unit-IV: Programmable Logic Controller

Basic functions of PLC, advantages over microcontroller, basic architecture, register basics, timer functions, counter function, ladder diagram, overview of PLC systems, I/O modules, power supplies, isolators, programming PLC, Alarm signal generation for a process (e.g. heating, cooling or threshold of a process etc.), direct digital control (DDC) algorithm

Practicals:

1. Interfacing of keyboard with microcontroller (8051)
2. Interfacing of LCD (16x2)
3. Interfacing of I²C clock IC (DS1307)
4. Interfacing of stepper motor
5. Interfacing of ADC (0808)
6. Interfacing of DAC (0809)
7. Designing of temperature data logger interfaced with PC through serial port
8. Interfacing of 2 microcontrollers using serial port
9. Design of simple robotic system

Books:

1. Embedded Systems: Architecture, programming and Design: Raj Kamal, TMH New Delhi
2. The 8051 microcontroller : Kenneth Ayala, Thomson Delmar Learning, New Delhi
3. 8051 Microcontroller : Mazidi&Mazidi, Penram Publishers, New Delhi
4. Programmable Logic Controllers- Principles & Applications: John W. Webb & Ronald A. Reis, Prentice Hall Inc. New Jersey
5. Datasheet and user manuals of AVR, PIC, ARM microcontrollers

References:

1. Programming & Customizing the 8051 Microcontroller: MykePredko, TMH, New Delhi
2. Robotic Engineering: Richard D. Klafter, Thomas A. Chmielewski, Michael Negin TMH, New Delhi
3. Embedded System Design: F. Vahid& T. Gargivis, John Wiley and Sons

M. Sc. (Electronics)
Semester II
Paper-II (PSCELET06): Biomedical Instrumentation

Theory: 60L

Credit: 4

Unit-I: Basic Principles of Biomedical Electronics

Bioelectrical signals, distribution of electrical potentials in different parts of the body, their magnitude and relationship to the physical status, processing of bio-electronic signals, different transducers for data acquisition; man-instrument system, biometrics

Unit-II: Recording Systems

General consideration of electronic recording: preamplifier, main amplifier and driver amplifier; considerations of noise; display systems: Oscilloscopes- long persistence, memory facility, multi-channel displays, flat panel displays, touch screens

Unit-III: Patient Safety and imaging techniques

Electronic shock hazards in biomedical instrumentation, Leakage current; grounding techniques; patient monitoring systems: foetus monitoring system and ICU; Need for imaging human body, imaging techniques: NMR, MRI, ultrasonic, X-ray tomography, endoscope, flexible bronchoscope and gastro scope

Unit-IV: Biomedical Instruments

Electro-encephalography (EEG), Electrocardiography (ECG), Electromyography (EMG), hemo-dialysis machine, traction, cardiac pacemakers, cardiac defibrillators; use of telemetry in diagnosis, Lasers in biomedical field

Practicals:

1. Design and study of op-amp based EEG signal amplifier.(input through simulation)
2. Design and study of electronic stethoscope
3. Design and study of body temperature measuring system
4. Design and study of respiratory rate measuring system
5. Design and study of arm pressure measuring system
6. Design of digital heart rate measuring system

Books:

1. Handbook of Biomedical Instrumentation –R. S. Khandpur, TMH, New Delhi
2. Biomedical Instrumentation – Leslie Cromwell, PHI Publication, New Delhi
3. Biomedical Engineering System – Leslie Cromwell, PHI Publication, New Delhi
4. Biomedical Phenomenon – Robert Plonsay, John Wiley & Sons
5. Computers in medicine – R. D. Lele, TMH, New Delhi
6. Introduction to Biomedical Equipment Technology: J. J. Carr and J. M. Brown, Pearson Education Asia Publication, Singapore

M. Sc. (Electronics)
Semester-II

Paper-III (PSCELET07): Computer Organization and Interfacing

Theory: 60L

Credit: 4

Unit-I: Computer Organization

A functional view of the computer, Pentium and power PC evolution, computer function and inter-connection, PCI bus, cache/main memory structures, DMA module, the external interface: fire wire and infiniband

Unit-II: Reduced Instruction Set Computers

Pipelining concepts, RISC architecture, comparison of complex instruction set computers (CISC) and RISC, RISC pipelining, organization of pipelining, overview of super-scalar and super-pipelined organizations

Unit-III: Data Acquisition Systems (DAQ)

Basic components of the DAQ system, functional block diagram of PC bus based DAQ system, data acquisition configurations, parallel port data acquisition; GPIB (IEEE-488), UART, USB interface; networked data acquisition

Unit-IV: Hardware Organization and PC interfacing

Expansion buses and I/O ports: ISA, EISA, PCI, USB port; Peripherals: Monitors, printers of different types; BIOS services; 8-bit ISA bus signals and their functions, timing diagrams of ISA bus cycles, interfacing to 8-bit ISA bus, interrupt handling, using DMA channels, limitation of 8-bit ISA bus; features of PCI bus, PCI system, standard parallel port (SPP), centronics, interfacing to parallel port and serial ports

Practicals

1. Study of expansion buses ISA, EISA, PCI and USB ports
2. Study of parallel port interfacing accessing
3. Study of serial/com port accessing
4. Interfacing of 5x7 display for character display
5. Interfacing of ADC 0808/DAC 0800
6. Interfacing of stepper motor to parallel port

References:

1. Computer Organization and Architecture: William Stallings, Pearson Education, New Delhi
2. PC based Instrumentation: Concepts and Practice: N. Mathivanan, PHI, New Delhi

M. Sc. (Electronics)
Semester-II
Paper-IV (PSCELET08): Virtual Instrumentation

Theory: 60L

Credit: 4

Unit-I: Virtual Instrument (VI)

Definition of VI, architecture of VI, development of Lab VIEW, graphical programming, advantages of Lab VIEW, palettes, sub VI, express VI, data flow program, modular programming

Unit-II: VI Programming Techniques

For and WHILE loops, feedback nodes, local and global variables, arrays, array functions, polymorphism, cluster operations, conversion between arrays and clusters, case and sequence structures, formula nodes, strings and file I/o, charts and graphs

Unit-III: Instrument Control

Instrument I/O Assistant, VISA, instrument drivers, serial port communications with GPIB, RS-232, USB, firewire, ethernet and IEEE-1394 controllers,

Unit-IV: Processing and Analysis tool kits

Control design and simulation tools, PID control, digital filter design and modulation tool kits, simulation of ECG signal, motion control systems, prototyping with Motion Assistant

Practicals:

1. Data acquisition using virtual instrumentation from temperature transducer
2. Data acquisition using virtual instrumentation from pressure transducer
3. Stepper motor control using virtual instrument
4. Creation of CRO using virtual instrument
5. Design of digital multi-meter using virtual instrument
6. Design of variable function generator using virtual instrument
7. Creation of digital temperature controller using virtual instrument
8. Machine vision concepts using virtual instrument

Books:

1. Virtual Instrumentation using Lab VIEW : Jovitha Jerome, PHI Learning Pvt. Ltd., New Delhi
2. Virtual Instrumentation using Lab VIEW : Sanjay Gupta and Joseph John, TMH, New Delhi

References:

1. Lab VIEW for Everyone: Jeffrey Travis and Jim Kring, Pearson Education, New Delhi
2. NI Lab VIEW user manual

PATTERN OF QUESTION PAPER

Max. Marks: 80

Time: 3 Hrs

Q1. Either

Unit-I 16 Marks

Or

Unit-I 16 Marks

Q2. Either

Unit-II 16 Marks

Or

Unit-II 16 Marks

Q3. Either

Unit-III 16 Marks

Or

Unit-III 16 Marks

Q4. Either

Unit-IV 16 Marks

Or

Unit-IV 16 Marks

Q5. Attempt the following.

a) Unit-I 4 Marks

b) Unit-II 4 Marks

c) Unit-III 4 Marks

d) Unit-IV 4 Marks

Note: -

1. Four units in each paper.
2. One question on each unit.
3. Fifth question on all units.
4. Maximum marks of each paper is 80.
5. Duration of question paper is of 3 hours.