Faculty of Science and Technology

Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

Syllabus
For

T. Y. B.Sc. (Electronics)

(*As per Choice Based Credit System*)

(With effect from June - 2020)

Preamble

The University Grants Commission (UGC) has initiated several measures to bring distinction, quality, and uniformity in the Higher Education System of the country. The important measures taken to enhance academic standards include enhancements in curriculum, teaching-learning process and examination and evaluation systems. In view of this, KBC North Maharashtra University, Jalgaon has taken several initiatives to upgrade and improve the academic excellence, examination reforms for overall development of the students. As per the expectations of UGC, KBC North Maharashtra University, Jalgaon is going to implement the Choice Based Credit (CBCS) pattern to undergraduate program. As per the initiatives led by the Honorable Vice Chancellor, Pro-Vice Chancellor and Dean of the Faculty of Science and Technology and academic bodies of our university, several meetings of board of studies members and concern teachers were organized for syllabus framing. All the participants cooperated with their constructive minds of re-structuring the syllabi of T.Y.B.Sc. (Electronics) as per the CBCS pattern and it has been finalized and the same will be effectively implemented from the academic year 2020-21. The main objective of reforming the syllabi of T.Y.B.Sc. (Electronics) is to create man power that can cater the present needs of the society with perfect understanding of Embedded Systems, Advanced microprocessors and microcontrollers etc. and complete skill to serve the industry and the country. It is expected that the students studying this course will apply their practical minds to solve real life problems of the society to serve the mankind.

Board of Studies (Electronics and Instrumentation),
KBC North Maharashtra University, Jalgaon.

Objectives:

1. To develop ability of students and motivate them to apply advanced concepts of Electronics to solve real life problems.
2. To prepare the students for successful career in industry and motivate them for higher education.
3. To provide exposure to the students for analyzing applications of embedded systems.
4. To provide knowledge on advanced microprocessors and microcontrollers and their applications for the society.
5. To provide necessary foundation on consumer and power electronics.
6. To develop observational skills and confidence in using hardware and software and relate the knowledge of practical concepts for the development of the society.
7. To apply the concepts of advanced Electronics in everyday life of people and appreciate its role to analyze the emerging problems from a societal perspective and development of country.

KBC North Maharashtra University, Jalgaon

Class: **T. Y. B. Sc.**

Subject: **Electronics**

Choice Base Credit System (With effect from June 2020)

The Board of Studies in Electronics in its meeting has unanimously accepted the revised syllabus (as per CBCS pattern) prepared by different committees, discussed, and finalized for T.Y.B.Sc. The titles of the papers for T.Y.B.Sc. (Electronics) are as given below:

Structure of curriculum of T. Y. B. Sc. (Electronics)

Semester V

Discipline	Course Type	Course Code	Course title	Credits	Hours/week (Clock hours)	Total Teaching hours	Marks (Total 100)	
							CA	UA
DSC	Core I	ELE-501	Semiconductor Electronics	3	3	45	40	60
	Core II	ELE -502	Advanced Digital System Design using VHDL	3	3	45	40	60
	Core III	ELE-503	Advanced Microprocessors	3	3	45	40	60
	Core IV	ELE-504	Electronic Instrumentation	3	3	45	40	60
DSC Skill Enhancement Course (SEC)	Skill Based	ELE-505	Medical Electronics	3	3	45	40	60
DSC Elective course	Elective Course (Any one)	ELE-506 (A)	Embedded C	3	3	45	40	60
		ELE-506 (B)	Basics Fiber Optic Communication					
DSC	Core (Practical)	ELE-507	Practical Lab I	2	4 (per batch)	60	40	60
		ELE-508	Practical Lab II	2	4 (per batch)	60	40	60
		ELE-509	Project Part I	2	4 (per batch)	60	40	60
Non Credit Audit Course	Elective audit course (Any one)	AC-501 : A	NSS	No credit	2	30	100	--
		AC-501 : B	NCC					
		AC-501 : C	Sports					

Semester VI

Discipline	Course Type	Course Code	Course title	Credits	Hours/week (Clock hours)	Total Teaching hours	Marks (Total 100)	
							CA	UA
DSC	Core I	ELE-601	Power Electronics	3	3	45	40	60
	Core II	ELE-602	Consumer Electronics	3	3	45	40	60
	Core III	ELE-603	Microprocessor Interfacing Techniques	3	3	45	40	60
	Core IV	ELE-604	Computer Network	3	3	45	40	60
DSC Skill Enhancement Course (SEC)	Skill Based	ELE-605	Embedded Systems	3	3	45	40	60
DSC Elective Course	Elective Course (Any one)	ELE-606 (A)	Electrodynamics	3	3	45	40	60
		ELE-606 (B)	Antenna & Wave Propagation					
DSC	Core (Practical)	ELE-607	Practical Lab I	2	4 (per batch)	60	40	60
		ELE-608	Practical Lab II	2	4 (per batch)	60	40	60
		ELE-609	Project Part II	2	4 (per batch)	60	40	60
Non Credit Audit Course	Elective audit course (Any one)	AC-601 : A	Soft skill	No credit	2	30	100	--
		AC-601 : B	Yoga					
		AC-601 : C	Practicing Cleanliness					

CA: Class assessment (Internal examination); UA: University assessment

Note: ***The Study tour: Industrial visit/Research lab visit is compulsory for the students of T.Y.B.Sc. (Electronics)***

Scheme for B.Sc. Program (Faculty of Science and Technology)

		First Year				Second Year				Third Year				Total Credit value
		Semester I		Semester II		Semester III		Semester IV		Semester V		Semester VI		
1	Core courses	Credits each	Courses	Credits each	Courses	Credits Each	Courses	Credits each	Courses	Credits each	Courses	Credits each	Courses	
	(i)Theory	4	4	4	4	4	3	4	3					4X14=56
	(ii)Practical	2	4	2	4	2	3	2	3					2X14=28
2	Ability enhancement compulsory course (AECC)(2)	2	1	2	1	2	1	2	1					2 X4 = 08
3	Skill Enhancement Course (SEC) (4)					2	1	2	1					2X 2 = 04
4	Discipline Specific Core DSC													
	(i) Core I to IV									3	4	3	4	3X8=24
	(ii) Core (Practical)									2	3	2	3	2X6=12
5	Skill Enhancement Course (SEC): Skill Based course									3	1	3	1	3 X 2 = 06
6	Elective Course (any one)									3	1	3	1	3 X 2 = 06
7	Elective Audit Course (out of 3)									None Credit	Any one	None Credit	Any one	--
	Total Credit value (Credit x No .of Courses)	26		26		22		22		24		24		144

Equivalence of the courses for T. Y. B. Sc. (Electronics)

Old Syllabus (June 2016) (Semester pattern 60:40)		New Syllabus (June 2019) CBCS pattern (Semester pattern 60:40)	
Course code	Paper	Course code	Paper
Semester V			
ELE 351	Semiconductor Physics	ELE 501	Semiconductor Electronics
ELE 352	Basic Communication Systems	ELE 506 (B)	Basics of Fiber Optic Communication
ELE 353	8086 Microprocessor	ELE 503	Advanced Microprocessors
ELE 354	The C Programming Language	ELE 504	Electronic Instrumentation
ELE 355	Microcontroller 8051	ELE 505	Medical Electronics
ELE 356	Advanced Digital System Design	ELE 502	Advanced Digital System Design using VHDL
ELE 357	General Lab – I Semiconductor Physics, Basic Communication, SPICE & VHDL	ELE 507	**Practical Lab I** (Semiconductor Electronics, Electronic Instrumentation, Basics of Fiber Optic Communication and Medical Electronics)
ELE 358	µP, µC and C/MATLAB Lab – I Microprocessor, Microcontroller & C	ELE 508	**Practical Lab II** (µP and VHDL)
ELE 359	Project Part-I	ELE 509	Project Part I
Semester VI			
ELE 361	Electrodynamics	ELE 606 (A)	Electrodynamics
ELE 362	Advanced Communication System	ELE 602	Consumer Electronics
ELE 363	Microprocessor Interfacing Techniques and Advanced Microprocessors	ELE 603	Microprocessor Interfacing Techniques
ELE 364	Numerical Simulation in Electroni	ELE 604	Computer Network
ELE 365	Embedded Systems	ELE 605	Embedded Systems
ELE 366	Industrial and Power Electronics	ELE 601	Power Electronics
ELE 367	General Lab - II Advanced Communication, Power and Industrial Electronics	ELE 607	**Practical Lab I** (Power Electronics, Consumer Electronics and Computer Network)
ELE 368	µP, µC and C/MATLAB Lab – II	ELE 608	**Practical Lab II** (µP, Embedded systems and Antenna & Wave propagation)
ELE 369	Project Part-II	ELE 609	Project Part II

Distribution of Course papers for T. Y.B. Sc. (Electronics) Semester: V

Discipline	Course Type	Course Code	Course title	Credits	Hours/week (Clock hours)	Total Teaching hours	Marks (Total 100)	
							CA	UA
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		AC-501 : B	NCC					
		AC-501 : C	Sports					

DSC Core Courses

ELE- 501: Semiconductor Electronics

Total Hours: 45		**Credits: 3**

Course objective

- To enrich the understanding of fundamentals of semiconductor devices.
- To have an awareness of IC fabrication techniques.

Learning outcomes

After successful completion of this course, students are expected to:

- Estimate the number of carriers at a given temperature for a semiconductor.
- Understand the importance of doping to change carrier density.

Unit	Topics	Lectures, Marks
Unit-1	**Crystal Structure:** Classification of solids: Single crystal, Poly crystal, Amorphous, Lattice, Basis and Crystal Structure, Translational Vectors, Unit cell, Primitive cell, Primitive Translational Vectors for SC, BCC and FCC, Co-ordination number, Atomic radii, Packing for SC, BCC and FCC structure, Miller indices.	**09 H 12 M**
Unit-2	**Semiconductor Basics:** Bonding forces in solids, Energy bands, Energy bands in Metals, Semiconductors and Insulators, Variation of energy bands with alloy, Concept of Effective mass, Fermi level, Acceptor, Donor, Intrinsic and Extrinsic Semiconductor, Semiconductor material (Elemental and Compound), Direct and Indirect band gap semiconductors, Degenerate and Non-degenerate semiconductors.	**09 H 12 M**
Unit-3	**Carrier Transport Phenomenon:** Density of states, Carrier concentration, Electron-hole concentration at equilibrium, Dependence of Fermi level on temperature and doping concentration, Carrier drift, Mobility, Resistivity, Conductivity, Hall effect.	**09 H 12 M**
Unit-4	**P-N Junction:** Fabrication of P-N Junction: Mention different methods of fabrication, Diffusion method. Equilibrium conditions: contact potential, space charge at junction, forward and reverse bias junction: Qualitative description of current flow at a junction, Reverse-bias break-down: Zener and avalanche breakdown.	**09 H 12 M**
Unit-5	**Integrated Circuits (IC) Fabrication:** Introduction and classification of ICs, Advantages and disadvantages of ICs over discrete components, Manufacturing process of monolithic ICs: Lithography, Etching, Diffusion and Metallization, Fabrication of discrete devices: Monolithic fabrication of BJT, Passive Components-Integrated circuit Resistor, Capacitor.	**09 H 12 M**
Suggested Readings	**1.** Charles Kittle, 'Introduction to Solid State Physics', John Wiley and Sons. **2.** Ben G. Streetman and Sanjay Kumar Banergee, 'Solid State Electronic Devices', PHI Publication. **3.** S O Kasap, 'Principle of Electronic Materials and Devices', Tata McGraw Hill Education. **4.** S. M. Sze and Kwok K. Ng, 'Physics of Semiconductor Devices', Wiley Student Edition. **5.** D. Roy Choudhury&Sahil B. Jain, 'Linear Integrated Circuits', New Age International Publisher. **6.** U. A. Bakshi, A. P. Godse, A. V. Bakshi, 'Linear Integrated Circuits', Technical Publications. **7.** Neil H. E. Weste, David Harris and Ayan Banergee, 'CMOS VLSI Design', Pearson Education.	

ELE 502: Advanced Digital System Design using VHDL

Total Hours:45 | **Credits: 3**

Course Objective

- ✓ To familiarize students with designing techniques of combinational and sequential circuits.
- ✓ Introduction of VHDL to students for different combinational and sequential circuits.

Learning outcome

After successful completion of this course, students are expected to:

- ✓ Students will able to design digital circuits according to requirements.
- ✓ Student will able to write VHDL code for digital circuit with the help of different modeling style.

Unit	Topics	Lectures, Marks
UNIT-1	**Introduction to VHDL**	
	Introduction, library, entity, architecture, modeling style, concurrent and sequential statements, identifier, data object and data types, attributes.	**05H, 10M**
UNIT-2	**Combinational Logic Circuits**	
	Introduction to combinational circuits, Revision of K-Map, Combinational logic examples (half and full adder, full subtractor, four bit binary adder, multiplexer and demultiplexers, any combinational circuits up to 3 input) *Ref. 1. (N. G. Palan)* *VHDL Programming:* half and full adder, full subractor, four bit binary adder, multiplexer and demultiplexers Idea of seven segment display (Common anode, common cathode) and designing of BCD to seven segment decoder. *Ref. 1 (N. G. Palan)*	**12H, 14M**
UNIT-3	**Flip Flop Circuits**	
	Introduction to R-S, J-K, T and D flip flops, Excitation table of flip flops, flip flop conversions: R-S to J-K, S-R to T, J-K to D and T to D *VHDL Programming:* Flip flops S-R, D, J-K, J-K master Slave and T Applications of Flip flops, *Ref. 2 (A. Anand kumar)*	**14H, 18M**
UNIT-4	**Sequential Logic Design**	
	State table, state diagram, state equation and state reduction in sequential logic design, Brief revision of counters: Design of Asynchronous counters - Design of Mod-6 counter using T flip flop, Design of Mod-10 counter using T flip flop *VHDL Programming:* Mod-6 asynchronous counter ***Design of Synchronous counter***s- Design of synchronous 3 bit up-down counter using J-K flip flop, Design of synchronous 3 bit up counter, Design of synchronous 3 bit down counter, Design of synchronous Mod-10 bit up-down counter using T flip flop, Design of synchronous modulo 6 Grey code counter. *VHDL Programming:* 3 bit up-down counter.	**14H, 18M**
Suggested Readings	1. "VHDL Primer", J. Bhaskar, Pearson Prentice Hall India 2. "VHDL Programming by Example", Douglas L Perry, McGraw Hill Professional. 3. "Digital Electronics and Logic Design", N. G. Palan, Technova Publications, Pune. 4. "Fundamentals of Digital Circuits" A. Anand Kumar, PHI Publication 5. "Digital Design", M. Morris Mano, Michael D. Ciletti, Pearson India 6. "Digital Logic and Computer Design", M Morris Mano, Prentice Hall India 7. "Modern Digital Electronics", R. P. Jain, Tata McGraw Hill Publishing. 8. "Digital Circuits and Design", S. Shalivahanan, Vikas Publishing House	

ELE 503: Advanced Microprocessor

Total Hours: 45 | **Credits: 3**

Course objective

- To learn the architecture of 8086.
- To learn the assembly language programming of 16 bit microprocessor
- To understand the architecture of advanced microprocessor 80386.
- To understand the feature of Pentium.

Learning outcomes

After successful completion of this course, students will be able to:

- Student will be able to Aware about the microprocessor and its architecture considerations & Capable to analyze the operating modes
- Understand the assembly language programming
- Student will be able to understand the advanced microprocessor 80386 and operation of paging mechanism.
- To gain the Knowledge about the Pentium series processor

Unit	Topics	Lectures
UNIT-1	**The Processor 8086** Register organization of 8086, Architecture, Pin diagram and its functions, Signal Descriptions of 8086, Physical memory organization, General bus operation, I/O addressing Capability, activities, concept of stack. Minimum and Maximum mode 8086, System Bus Timing.	**10H, 14M**
UNIT-2	**8086 Instruction Set** Machine language instruction formats, Addressing mode of 8086, Instruction set of 8086:- Data Copy / Transfer Instructions, Arithmetic and Logical Instructions, Branch Instructions, Loop Instructions, Machine control Instructions, Flag Manipulation Instructions, Shift and Rotate Instructions, String Instructions.	**10H, 12M**
UNIT-3	**Assembler Directives and Operator** Data Definition and Storage Allocation, Structures, Records, Assigning Names to Expressions, Segment Definition, Program Termination, Alignment Directives, Value-Returning Attribute Operators.	**10H, 10M**
UNIT-4	**Programming of 8086** Simple assembly language program, Loop program and String processing program.	**08H, 12M**
UNIT-5	**Intel 80386 & Pentium Operators** Key features of Intel 80386 – internal architecture of 80386 - operating modes - paging mechanism, Pentium processor – its features	**07H, 12M**
Suggested Readings	1. "Advanced microprocessor and peripherals (Architecture Programming and Interfacing)",A.K. Ray, K. M. Bhurchandi, TMH Publication. 2. "Microprocessor system: 8086/8088 family Architecture Programming and design)", Yu Cheng Liu and G.A.Gibson, PHI Publication. 3. "Microprocessor and Interfacing", D. Hall 1995, TMH Publication. 4. "The 8088 and 8086 microprocessor (Programming, Interfacing, Software, Hardwareand applications)", Walter A. Triebel, Autarsingh. 5. "Microprocessor and Interfacing Techniques", A. P. Godse. D. A. Godse, Technical Publication, Pune.	

ELE – 504: Electronic Instrumentation

Total Hours: 45	**Credits: 3**

Course objective

- To provide adequate knowledge in electrical instruments and measurements techniques.
- To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.
- Introduction to general instrument system, error, calibration etc. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
- Exposure to various transducers and data acquisition system.

Learning outcomes

After successful completion of this course, students are expected to

- Understand the concept of measurement systems and its various characteristics
- Learn about different types of transducers and their working principle.
- Know the different electronics measuring instruments and develop the skill to handle them.
- Aquent the knowledge of testing instruments.

Unit	Topics	Lectures
UNIT-1	**Basic Measurement Concepts** Measurement systems, Fundamental elements of measurement system, Static and Dynamic characteristics, Accuracy and Precision, Sensitivity, Linearity, Resolution, Repeatability; Errors such as Gross error, Systematic error, Absolute and Relative error, Random error	**8H, 10M**
UNIT-2	**Transducers and sensors:** Classification of transducers, Basic requirement/ characteristics of transducers, active & passive transducers, Resistive (Potentiometer, Strain gauge– Working Principle and applications), Capacitive (Variable Area Type – Variable Air Gap type – Variable Permittivity type), Inductive (LVDT) and piezoelectric transducers	**8H, 10M**
UNIT-3	**Signal generators and Oscilloscopes** **Signal Generators**: Introduction, Block diagram of standard signal generator, AF sine and square wave generator, Function generator, Square and Pulse generator, Sweep generator, Frequency synthesizer. **Cathode Ray Oscilloscopes (CRO)**-block diagram, front panel controls, and measurement of amplitude, frequency and phase. Dual trace and dual beam CRO.	**12H, 16M**
UNIT-4	**Digital Measuring Instruments** Digital Storage Oscilloscope (DSO)-Block diagram, advantages and applications. Digital Multimeter (DMM)-Block diagram and working, Digital Frequency Meter (DFM)-Working principle, Block diagram, measurement of frequency and time.	**9H, 14M**
UNIT-5	**Data Acquisition System and Data logger** **DAS:** Introduction, general block diagram of DAS, Single channel and multi-channel DAS, PC based data acquisition, ADC and DAC, Typical on board DAQ card, Representation of analog signals in the digital domain, Resolution and sampling frequency, Multiplexing of analog inputs, Single-ended and differential inputs, Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card. **Data Loggers:** Characteristics of data loggers, Block diagram and basic operation of data logger. (H S Kalsi)	**8H, 10M** **12**

Suggested Readings	1. Albert D. Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Pearson / Prentice Hall of India, 2007. 2. B.C. Nakra and K.K. Choudhry, "Instrumentation, Measurement and Analysis", 2nd Edition, TMH, 2004. 3. H.S. Kalsi, "Electronics Instrumentation", Tata McGraw Hill, 2012 4. A. K. Sawhney, "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai and Co, 2004. 5. Joseph J. Carr, "Elements of Electronics Instrumentation and Measurement", Pearson India 6. Alan. S. Morris, "Principles of Measurements and Instrumentation", 2nd Edition, Prentice Hall of India 2003 7. David A. Bell, "Electronic Instrumentation and Measurements", Prentice Hall of India Pvt. Ltd, 2003. 8. James W. Dally, William F. Riley, Kenneth G. McConnell, "Instrumentation for Engineering Measurements", 2nd Edition, John Wiley, 2003	

DSC Skill Enhancement Course (SEC) SEC-III: Skill Based

ELE- 505 : Medical Electronics

Total Hours: 45	**Credits: 3**

Course objective

- To aware students with the role of electronics in medical industry
- Aware the students with concepts of electrical signals that can be measured
- To orient with electronic circuits required in medical equipment
- To introduce the application of advanced biomedical electronics

Learning outcomes

After successful completion of this course, students are expected to:

- Familiarize with human assist devices
- Learn biological signals present in human body
- Learn the various blocks of biomedical sensors
- The electrodes which are normally used to measure the biological signals
- Understand the working principles of various therapeutic and monitoring systems
- Understand recording and analysis of prominent biosignals of human
- Understand the measurement and analysis techniques for physiological parameters
- Understand the patient imaging and monitoring systems

Unit	Topics	Lectures
UNIT-1	**Bioelectric signals and Physiological transducers:** Cell characteristics, ***Bio-electric potential:*** Origin, Resting and action potential, depolarization and repolarisation, propagation of action potentials, ECG, EEG and EMG waveforms with typical characteristics. ***Electrodes:*** Types, Electrodes used for ECG, EEG and EMG. Selection of physiological transducers, ***Physiological transducers:*** Pressure, Temperature, photoelectric & ultrasound Transducers. Measurement in ***Respiratory system:*** Physiology of respiratory system, Measurement of breathing mechanics, Humidifiers, Nebulizers Aspirators.	**12 H 10 M**
UNIT-2	**Unit – 2: Basic recording systems** Block diagram of ECG, isolated preamplifier, ECG leads, effects of artifacts on ECG recordings, Multichannel ECG machine, Block diagram of EEG machine, 10-20 electrode placement system for EEG, and Evoked potential, Working of EMG with block diagram.	**07 H 12 M**
UNIT-3	**Unit – 3: Therapeutic Equipment** ***Cardiac pacemakers***- external and implantable pacemakers and programmable pacemaker. ***Defibrillator***-internal and external, AC and DC defibrillators, block diagram of microprocessor based defibrillator. ***Diathermy***- types, schematic of microwave diathermy unit, Surgical diathermy – principle, working of solid state surgical diathermy machine. ***Laser***- different types of lasers and their applications in medicine, ***Ventilators***- Working, microprocessor based ventilator, high-frequency ventilator.	**10 H, 15 M**
UNIT-4	**Unit – 4: Bio Amplifier** Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier, Chopper amplifier, Power line interference.	**08 H, 14 M**
UNIT-5	**Unit- 5: Biochemical sensors and Patient safety** ***Biochemical sensors*** - pH, pO2 and pCO2, ***Blood glucose sensors*** - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer ***(simplified schematic description)***. ***Patient safety*** - Physiological effects of electric current, micro and macro shock-preventive measures, Precaution, safety codes for electro medical equipment, Electric safety analyzer, E-waste- Sources and disposal.	**08 H, 09 M**
Suggested Readings	**Text Books** 1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004. **(Units 5)** 2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata	

	McGraw-Hill, New Delhi, 2003**. (Units 4)** 3. Joseph J. Carr& John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson. 4. Shakti Chatterjee, "Textbook of Biomedical Instrumentation System", Cengage Learning. 5. Bertil Jacobson & John G. Webster- Medicine and clinical Engineering, PHI. 6. Prof. S. K. Venkata Ram- Bio-Medical Electronics and Instrumentation, Galgotia Publications 7. Principals of Biomedical Electronics and Biomedical Instrumentation, C Raja Rao, University Press 8. Introduction to Biomedical Engineering, Michal Domach, Pearson Education 9. Introduction to Biomedical Instrumentation –Mandeep Singh, PHI Learning 10. Principles of Medical Electronics and biomedical Instrumentation- S.K. Guha, University Press India Ltd. 11. Biomedical Instrumentation –Dr. M. Arumugam **References:** 1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007. **2.** Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", McGraw Hill Publisher, 2003. 3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology".	

DSC Elective Course (Any one)

ELE 506 (A): Embedded C

Total Hours: 45		**Credits: 3**

Objectives:

1. To know about programming used for embedded system and robotics
2. To provide experience to integrate hardware and software for embedded applications systems.
3. To acquaint students with methods of executive device control and to give them opportunity to apply and test those methods in practice.

Learning Outcomes

After successful completion of this course, students are expected to:

1. Learn structure oriented programming concepts required in all other languages.
2. After completion of this course students are able to built real world applications based on embedded system and automation.

Unit	Topics	Lectures
Unit 1	**Fundamentals of Embedded C** What is an Embedded System? Programming Embedded Systems. Factors for Selecting the Programming Language. Difference in C and Embedded C. Basic Structure of an Embedded C Program (Template for Embedded C Program). Different Components of an Embedded C Program. Examples of Basic Embedded C Program.	**06 H, 08M**
Unit 2	**Introduction of Embedded C** Keywords and Identifiers, Constant, Variables. Data Types: Primitive, derived and User defined. Declaration of variables. Assigning values to variables. Storage Classes: External, Global, Static, Auto. Operators: Arithmetic operator, Relational operator, Logical operator, Assignment operator, Increment-decrement operator, Conditional operator, Ternary operator, Bitwise operator, Special operators. Operator precedence and Associativity. I\O statements: Reading and writing a single character, Standard and Formatted Input and Output statements, Preprocessor Directives (#define, #include, etc), Simple programming exercises	**10 H, 12 M**
Unit 3	**Decision Making, Branching and Looping** Statements – if, if-else, Nested if-else, else-if Ladder, switch, break, continue, goto. Entry and Exit controlled loops: while loop, do-while loop, for loop. Difference in while and do-while loop, Features of for loops, Nesting of for loops, Simple programming exercises.	**09 H, 12 M**
Unit 4	**Arrays and Character strings** One-dimensional array – Declaration and Initialization, Traversing of array. Two-dimensional array – Declaration and Initialization, Traversing of array. String – Declaring and Initializing string. Reading strings from terminal. Writing strings to screen. String Operations: copy, length, compare, search, manipulate. Simple programming exercises.	**06 H, 10 M**
Unit 5	**User Defined Functions** Need of functions, Form of functions, Calling function, Function returning value, Category of Functions, Recursion, Simple programming exercises	**06 H, 08 M**
Unit 6	**Real World Interfacing using Embedded C Programming** Introduction. Interface: LED, DC motor, stepper motor, LCD, 7-seg. display, Matrix keyboard, temperature sensor, ADC and DAC. (**Note:** This chapter is based on interfacing the basic but most common devises used in automation. It is expected that the interfacing should be done on 8051 development board (or any other controller) rather than simulator)	**08 H, 10M**
Reference books:	1. First Steps with Embedded Systems, by Byte Craft Limited. 2. Embedded C, by Michael J. Pont, Addison-Wesley. 3. Embedded C programming Techniques and Applications of C and PIC MCUS, by Mark Siegesmund. 4. C Programming for Embedded Systems, by Kirk Zurell. **5.** The 8051 Microcontroller and Embedded Systems using Assembly and C, by Muhammad Ali Mazidi.	

ELE-506(B): Basics of Fiber Optic Communication

Total Hours: 45	**Credits: 3**

Course objectives

- To provide the essential concepts of optical fiber communication.
- To study different types of fibers, losses, signal distortion.
- To learn the various optical sources, materials and fiber splicing.
- To acquire knowledge of the fiber optical receivers.

Learning outcomes

After successful completion of this course, students are expected to:

- Recognize and classify the structures of Optical fiber and types.
- Classify the Optical sources, detectors and to discuss their principle.
- Understanding losses and dispersion.
- Awareness of analog and digital links.

Unit	Topics	Lectures
Unit-1	**Introduction to Optical Fiber Communication System**: Introduction to optical fiber, general optical fiber system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, **Ray theory:** Total Internal Reflection, Acceptance Angle, Numerical Aperture, **Optical Fibers**: fiber materials, fiber optic cables. Step index-single mode fibers, Graded index-Single mode fibers, Step index-Multimode fibers and Graded index-Multimode fibers.	**09 H 12 M**
Unit-2	**Transmission Characteristics of Optical Fiber:** Attenuation, absorption, scattering losses, bending losses, core and cladding losses, signal dispersion, intra modal dispersion, material dispersion, waveguide dispersion, polarization mode dispersion, intermodal dispersion, dispersion optimization of single mode fiber, characteristics of single mode fiber, R-I Profile and cutoff wave length, mode field diameter.	**10 H 13 M**
Unit-3	**Optical Sources and Detectors:** Types of Optical Sources, Characteristics of optical sources required for OFC system, LED's :Structure, Planer LED, Dome LED, LASER diodes: Types of Photo detectors, characteristics features of Photo detector required for OFC system, Photo diodes (Physical Principle, PIN and avalanche Photodiode), comparison of different photo detectors.	**08 H 11 M**
Unit-4	**Fiber Couplers and Connectors:** Fiber alignment, mechanical misalignment, lensing scheme for coupling improvement. Fiber Splices, Types: fusion, mechanical. Fiber connectors, Principle of good connector design. Types: SC, ST, MT-RJ, Butt Joint connectors, Commercial connectors (student expected to know only names of these connectors)	**08 H 12 M**
Unit-5	**Optical Receiver and Transmitter:** Introduction to Optical Receiver and Transmitter, Block diagrams with basic elements, working operation, sensitivity of receiver, quantum limit, eye diagrams, coherent detection, burst mode receiver operation, Analog receivers, Optical transmitter specifications, spectral line-width and extinction ratio. Simple point to point link and it's design considerations.	**10 H 12 M**

Suggested Readings	**1.** Gerd Keiser, 'Optical Fiber Communication', 4th Ed., Mc-Graw Hill, 2008. **2.** John M. Senior, 'Optical Fiber Communications',3rd edition, 2007, Pearson Education. **3.** Govind P. Agarwal,' Fiber-Optic Communications Systems', 4th edition, A John Wiley & Sons, Inc., Publication. **4.** Joseph C Palais,' Fiber Optic Communication', 4th Edition, Pearson Education. **5.** V.S. Bagad,'Optical Fiber Communication System', Technical Publication, Pune.	

DSC Core (Practical)

ELE – 507: Practical Lab I

Total Hours: 60 **Credits: 4**

A) **Semiconductor Electronics (Any two)**

1. Measurement of Resistivity of a given sample by four probe method.
2. To find Hall coefficient of a given sample using Hall probe.
3. Measurement of energy band gap of given diode/ Measurement of energy band gap of given sample using four probe method.
4. Study characteristics of pn junction using MATLAB simulation.
5. Study output of RC integrator/differentiator using MATLAB simulation.

B) Electronic Instrumentation (Any four)

1. Measure the angular displacement using potentiometric (resistive) transducer.
2. To study the characteristics of capacitive transducer.
3. Measurement of torque using strain gauge.
4. Measurement of strain using strain gauge.
5. Study of Linear Variable Displacement Transducer (LVDT).
6. Measurement of frequency and time period using digital frequency meter.
7. Study and measurement of voltage, frequency and phase difference of a.c. quantities using C.R.O.
8. Study and measurement of quantities using D.S.O.
9. Study of function generator (IC8038).
10. Built and test square and triangular wave generator using opamps.
11. Study of Data Acquisition System.

C) Medical Electronics(Any four)

1. Study of ECG/EEG/EMG electrodes
2. Study of temperature sensor for contact measurement (LM35//Thermistor).
3. Study of non-contact temperature measurement system (Infrared thermometers).
4. Study of ultrasonic sensors (Sensitivity/Directivity)/ Study of social distance maintenance equipment.
5. Study of heart rate sensor
6. To operate and familiarize with BP apparatus, ECG machine, ventilator, incubator, Boyle's apparatus, pulse oxymeter.
7. Study instrumentation Amplifier using Opamps.
8. To design and setup a bio-amplifier for a gain of 10 and to calculate the CMMR (Simulation/Actual Circuit)
9. To design and setup a threshold detector circuit using op-amp for a voltage level of 5V(Simulation/Actual Circuit)
10. Design a band pass filter to filter out the 'QRS complex' from the amplified ECG signals (Simulation/Actual Circuit).
11. To design a band pass filter to obtain the alpha frequency band of an amplified EEG signal (Simulation/Actual Circuit).

D) Basics of Fiber Optic Communication

1. To Study and compare I-V characteristics of three LEDs with different colors.
2. To study the I-V characteristics of Photo diode
3. To study opto-coupler characteristics.
4. To establish analog link using Optical Fiber.
5. To establish voice link using optical fiber.
6. To measure Propagation loss in optical fiber.
7. To measure bending loss in optical fiber.
8. To Transmit and receive Pulse Amplitude Modulated (PAM) signal using optical fiber
9. To measure Numerical Aperture and Acceptance angle of Optical Fiber

Note:

1. Student offering Elective course **ELE 506 (A) Embedded C**, should perform Any two practical from group A, any four practical from group B and C (Total 10 Practical).
2. Student offering Elective course **ELE 506 (B) Basic Fiber Optics Communication**, should perform any two practical from group A & B, any three practical from group C & D (Total 10 Practical).

ELE – 508: Practical Lab II (Microprocessor and VHDL)		
Total Hours: 60		**Credits: 4**
A)	**Microprocessor (Any five)**	
	1. Write a program to display A to Z with one space and ten characters in one line. 2. Write a program to display A to Z in one line and 0 to 9 in next line. 3. Write a program to display a string. 4. Write a program to change upper case to lower case / lower case to upper case. 5. Write a program to find sum of given numbers. 6. Write a program to find the average of given numbers. 7. Write a program to find factorial of a given number. 8. Write a program to convert 8 bit decimal number to hexadecimal number. Write a program to find the hexadecimal number of a given BCD number.	
B)	**VHDL programming (Any five)**	
	1. Simulation of logic gates using VHDL 2. Simulation of half Adder using VHDL 3. Simulation of full Adder using VHDL 4. Simulation of full subtractor using VHDL 5. Simulation of four bit binary adder using VHDL 6. Simulation of multiplexer using VHDL 7. Simulation of demultiplexers using VHDL 8. Simulation of S-R Flip flop using VHDL 9. Simulation of D Flip flop using VHDL 10. Simulation of Mod-6 Asynchronous counter using VHDL 11. Simulation of 3 bit up-down counter using VHDL	

ELE – 509: Project Part I

Total Hours: 60 | **Credits: 4**

During project work, follow the following guidelines –

1. Title of the project must be well defined.
2. Planning of the project must be specified.
3. Aim, Objectives, Designing and theoretical background of the work should be specified in detail.
4. Actual work done must be reported along with experimental procedure.
5. There must be observations, results and conclusions of the project work.
6. In case of the projects related to the development of computer software algorithm, program strategy, module wise description etc must be provided.
7. Applications of the work must be specified clearly.
8. Further extension / future scope of the work may be suggested for better outcome of the project.
9. References must be specified

Semester wise Planning & Evaluation of the project work

Work assigned	Marks	Total
1. Selection of Project and Literature Survey	20	60
2. Study Tour: Industrial/Research Lab Visit	20	
3. Presentation of the Project Progress Report	20	

Distribution of Course papers for T. Y.B. Sc. (Electronics) Semester: VI

Discipline	Course Type	Course Code	Course title	Credits	Hours/week (Clock hours)	Total Teaching hours	Marks (Total 100)	
							CA	UA
DSC	Core I	ELE-601	Power Electronics	3	3	45	40	60
	Core II	ELE-602	Consumer Electronics	3	3	45	40	60
	Core III	ELE-603	Microprocessor Interfacing Techniques	3	3	45	40	60
	Core IV	ELE-604	Computer Network	3	3	45	40	60
DSC Skill Enhancement Course (SEC)	Skill Based	ELE-605	Embedded Systems	3	3	45	40	60
DSC Elective course	Elective Course (Any one)	ELE-606 (A)	Electrodynamics	3	3	45	40	60
		ELE-606 (B)	Antenna & wave propagation					
DSC	Core (Practical)	ELE-607	Practical Lab I	2	4 (per batch)	60	40	60
		ELE-608	Practical Lab II	2	4 (per batch)	60	40	60
		ELE-609	Project Part II	2	4 (per batch)	60	40	60
Non Credit Audit Course	Elective audit course (Any one)	AC-601 : A	Soft skill	No credit	2	30	100	--
		AC-601 : B	Yoga					
		AC-601 : C	Practicing Cleanliness					

DSC Core Courses

ELE – 601 Power Electronics

Total Hours: 45 | **Credits: 3**

Course objective

- Familiarize the students to the construction details, operation and characteristics of different semiconductor power electronics devices along with their few applications.
- Introduction of different power conversion circuits.
- To make strong base of students for further study of power electronics circuits and systems

Learning outcomes

After successful completion of this course, students are expected to:

- have fundamental knowledge of semiconductor power electronic device
- can apply this knowledge for designing power electronic circuits

Unit	Topics	Lectures/ Mark
UNIT-1	**Power Devices:** Need for Semiconductor Power Devices, Power Diodes, Enhancement of Reverse Blocking Capacity, Introduction to Family of Thyristors. Basic Structure, symbol, working, I-V Characteristics, Applications of SCR, DIAC and TRIAC. Ratings: Latching Current, Holding Current, dv/dt & di/dt rating, I^2t rating, surge current rating. List of applications of SCR	**12 H, 14 M**
UNIT-2	**Switching circuits for SCR** **Methods of Triggering**: Gate triggering, Voltage triggering, Thermal triggering and Radiation triggering, Triggering of SCR using UJT, Triggering of SCR using BJT. Turn off circuits- Natural & Forced Commutation, types of forced commutation (all classes).	**8 H, 12 M**
UNIT-3	**Controlled Rectifiers** **Single Phase Circuits:** Thyristor half wave Rectifier (Resistive load), Thyristor half wave Rectifier (Inductive load), Thyristor Full Converter (Resistive load), Thyristor Full Converter (Inductive load).	**7 H, 10 M**
UNIT-4	**Inverters and Converters** **Inverters** - Introduction, Industrial applications, types of inverters, Single Phase Bridge inverter, Single Phase Centre Tapped Inverter, Series Inverter. **Converters (choppers) -** Introduction, Principle of Step down Chopper (variable frequency and constant frequency control), Step up chopper, Chopper Classification, Chopper Configurations.	**10 H, 12 M**
UNIT-5	**Applications of SCR and High frequency heating** **Applications of SCR** - Uninterruptible power supplies, over voltage protection, simple battery charger, fan regulator using DIAC and TRIAC. **High frequency heating applications -** Induction heating – principle, application as induction heater Dielectric Heating – principle, application in sterilization	**8 H, 12 M**
Suggested Readings	1. "A Text Book on Power Electronics", H.C. Rai, Galgotia Publication, 2. "Power Electronics" H.C. Rai, Galgotia Publication 3. "Industrial Electronics" G. K. Mithal, Khanna Publishers 4. "Thyristor & Their Applications", M. Ramamoorty, EWP. 5. Principles of Electric Machines and Power Electronics, 3rd Edition	

ELE 602: Consumer Electronics

Total Hours:45 | **Credits: 3**

Course Objectives:

- To give students an in depth knowledge of various electronic audio and video devices and systems.
- Introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices.
- To develop the capabilities of assembling, fault diagnosis and rectification in a systematic way.
- To create skill of installation of various electronics appliances like Set Top box (D2H), CATV and Dish TV, water purifier, Air conditioner etc.

Learning outcomes

After successful completion of this course, students are expected to:

- Understand the various type of microphones and loud speakers.
- To identify the various digital and analog signal.
- Understand the various type of consumer goods and acquaint the skill of fault findings.
- Develop the skill of electronics appliances like Set Top Box, CATV and Dish TV, water purifier, Air conditioner etc.
- Acquaint the knowledge of different types of Television Technology.

Unit	Topics	Lectures/ Marks
UNIT-1	**Audio System**	**10H, 14M**
	Microphone: Characteristics of microphone, different types of microphone, Electret & carbon microphones (principle, construction, working and characteristics). **Special Microphones:** Lavalier microphone, Tie-clip microphone, Radio microphone and Noise cancelling microphone. **Loudspeaker:** Characteristics of Loudspeaker, Horn type, Multiway speaker system (Woofers & Tweeters). **P.A. System:** Need and Use, Block diagram of P.A. system, Requirements of PA system, typical P.A. Installation planning (P.A. system for a public meeting in Public Park and P.A. System for an auditorium having large capacity)	
UNIT-2	**Digital Television and Video**	**10H, 14M**
	Introduction to Liquid Crystal Display, Plasma, LED and OLED Screen Televisions, Basic block diagram of LCD and LED Television and their comparison. Concept of HD TV, smart TV, closed circuit TV. Introduction of Direct to home satellite TV (D2H), Block diagram of D2H TV system, Cable TV system, (R.G. Gupta p.n. 346), Personal Video Recorders (PVRs), Video on Demand. (S. P. Bali, p.n. 706)	
UNIT-3	**Office Appliances**	**08H, 10M**
	Computer System (Block Diagram, function of each block), Scanners, Barcode reader, Printers, Photocopier (Xerox Machine)- block diagram, features and specification. Multifunction units (Print, Scan, fax, and copy).	
UNIT-4	**Modern Home Appliances**	**17H,**

	Microwave Oven – Principle of Operation, Block Diagram, Safety instructions -Care andCleaning, features and specifications **Washing Machine -** Principle of Operation, fuzzy logic, Washing machine with fuzzy logic, Block Diagram, features and specifications. **Remote Control:** Operating Principle, Block Diagram, Operation and features. **Electronic Weighing Systems** - Operating principle, Block diagram, features. **Home security system,** I Introduction of **Air conditioners (AC)**, Components of AC, Types of AC, **Water Purifier**.	**22M**
Suggested Readings	1. Consumer Electronics by R. P. Bali, Pearson Education (2008) 2. Audio and Video systems by R. G. Gupta, Tata McGraw Hill (2004) 3. Consumer Electronics by J. S. Chitode, Technical Publication Pune 4. Electronic and Electrical Servicing Consumer and Commercial Electronics, by Ian Sinclair & John Dunton.	

ELE 603: Microprocessor Interfacing Techniques

Total Hours: 45 | **Credits: 3**

Course objective

- To learn the interfacing of I/O devices with microprocessor.
- To learn interfacing techniques.
- To learn about the basic peripherals interfacing.
- To learn about the programmable interval timer and their Interfacing

Learning outcomes

After successful completion of this course, students will be able to:

- Student will be able to Aware about the concept of microprocessor and its interfacing & Capable to analyze the operation and priorities of Interrupt
- Understand the concept of memory mapping & DMA
- Student will be able to understand the ADC & DAC interfacing
- To gain the Knowledge about the programmable interval timer and communication interface 8251 & analyze the operating modes.

Unit	Topics	Lectures
UNIT-1	**Special Architectural Features and Related Programming** Interrupts and interrupt service routines, interrupt cycle of 8086, NMI and maskable Interrupt, interrupt Programming, Macros. Programming using Dos Interrupt: INT 21H (Function 01H, 02H, 09H, 4CH, 10H).	**11H, 15M**
UNIT -2	**I/O Programming and Interfacing** Fundamental I/O Considerations, Programmed I/O, Interrupt I/O, Interfacing in I/O, Mapped I/O, Interfacing in Memory Mapped I/O, DMA Controller IC 8257- its features, block diagram and interfacing with 8086	**11H, 14M**
UNIT-3	**Basic & Special Programmable Peripheral devices and their Interfacing** Block diagram of ADC -0808 and its interfacing, DAC 0800 interfacing, Stepper motor interfacing. Programmable Interval Timer 8253 – Internal block diagram, operating mode of 8253	**12H, 16M**
UNIT -4	**Communication Interface Peripheral** Serial Communication interface, Asynchronous and synchronous communication, Parallel communication interface, Programmable communication interface 8251- Internal Architecture and operating modes	**11H, 15M**
Suggested Readings	**Reference Books:** 1. "Advanced microprocessor and peripherals (Architecture Programming and Interfacing)",A. K. Ray, K. M. Bhurchandi, TMH Publication. 2. "Microprocessor system: 8086/8088 family Architecture Programming and design)", Yu Cheng Liu and G.A.Gibson, PHI Publication. 3. "Microprocessor and Interfacing", D. Hall 1995, TMH Publication. 4. "The 8088 and 8086 microprocessor (Programming, Interfacing, Software, Hardware and applications)", Walter A. Triebel, Autarsingh. 5. "Microprocessor and Interfacing Techniques", A. P. Godse. D. A. Godse, Technical Publication, Pune.	

ELE 604: Computer Network

Total Hours: 45		Credits: 03

Course Objectives:

- To develop an understanding of computer networking basics.
- To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.

Learning Outcomes:

- Recognize the technological trends of Computer Networking.
- Discuss the key technological components of the Network.
- Evaluate the challenges in building networks and solutions to those.

Unit	Topics	Lectures
Unit 1	**Fundamentals of Computer Network** 1.1. Needs, uses of Computer Network, Applications of Computer, Network, Benefits of Computer Network: Sharing of Information, Sharing Resources, Centralized Management of resources, backing up of data. 1.2. Classification of Networks: Geographical Classification, Classification Based on Transmission Technology, Classification Based on Network Relationships 1.3. Basics of network computing models: per-to-peer, client server, distributed Network Operating System (NOS): its types, features and applications.	**08 H, 10 M**
Unit 2	**Network Components and Topologies:** 2.1. Basic Components of Computer Network: Cables. Host, Communication Subnet. NJC. 2.2. Network Devices and their role: Repeaters, Hub, Bridge, Switches, Router 2.3. Network Topologies: Concept Significance, Bus, Star, Ring, Tree, Mesh,	**08 H, 10 M**
Unit 3	**Reference Models for Computer Networks:** 3.1. Protocol Hierarchies-Layered Approach 3.2. Interfaces, Services, Protocols and Packets 3.3. Design issues for layering. 3.4. OSI reference Model: layers and their functions. 3.5. TCP/JP Protocol: Layers and their functions 3.6. OSI Model Vs.TCP/IP	**10 H, 12 M**
Unit 4	**TCP/IP Protocol Suite:** 4.1. Host-to-Network Layer Protocols: SLIP ,PPP 4.2. Internet Layer Protocols: IP, ARP,RARP,ICMP. 4.3. Transport Layer Protocols: TCP, UDP. 4.4. Application Layer Protocols: FTP, HTTP, SMTP, TELNET, DNS, BOOTP, DHCP	**08 H, 10 M**
Unit 5	**Wireless LANS & Virtual Circuit Networks** 5.1. Introduction, 5.2. Wireless LANS: IEEE 802.11 project, 5.3. Bluetooth, Zigbee. 5.4. Connecting devices and Virtual LANS.	**05 H, 08 M**
Unit 6	**Introduction and Cloud Computing Technology:** 6.1. Shift from distributed computing to cloud computing; 6.2. Principles and characteristics of cloud computing- IaaS, PaaS, SaaS; 6.3. Service oriented computing and cloud environment, 6.4. Client systems, Networks, Server systems and security from services perspectives, 6.5. Accessing the cloud with platforms and applications; cloud storage.	**06 H, 10 M**
Suggested Readings	1. Computer networks : Tanenbumb, Andrew S. PHI learning New Delhi 2. TCP/Ip Protocol Suit : Forouzm Behrouz A. McGrawHill ,New Delhi,2006 3. Data Communication and networking :Forouzm Behrouz A. McGrawHill	

	,New Delhi 2006 4. Data Communication and networks : Godbole ,Achyut McGrawHill ,New Delhi 2006 5. Computer network Topdown approach : Korus Pearson **6.** Cloud Computing – A Practical Approach, Anthony T. Velte, Toby J. Velte and Robert E, TMH 2010. **7.** Cloud Computing – Web based Applications: Michael Miller, Pearson Publishing, 2011.	

DSC Skill Enhancement Course (SEC) SEC-IV Skill Based

ELE 605: Embedded Systems

Total Hours: 45	**Credits: 3**

Course objective

- To know about 8051 microcontroller programming
- To learn the 8 bit microcontroller interfacing.
- To learn about the SPI & two wire interface

Learning outcomes

After successful completion of this course, students will be able to:

- To gain the knowledge about the 8051-microcontroller programming such as timer & counter and serial port programming
- Understand the basic concept of interfacing with microcontroller
- Understand the interfacing principle with Stepper motor and temperature sensor
- To gain the Knowledge about the serial peripheral interface and two wire interface.

Unit	Topics	Lectures/ Marks
UNIT-1	**Introduction to Embedded System (06M)** Introduction to Embedded Systems, Stand-alone and real-time embedded systems. Requirements of embedded systems, Components of embedded system. Programming languages and tools. Embedded operating system. Embedded system Application examples	**06H, 06M**
UNIT -2	**Timer and Counter Programming** Single bit Programming, Timer modes, Programming the timers in various modes (Mode 1 and Mode2), Counter Programming. To generate delay of milliseconds & square wave.	**10H, 14M**
UNIT-3	**Serial Port Programming** Basic of serial communication (Serial Vs Parallel data Transfer, Simplex, Duplex), Serial port of 8051, Baud rate in 8051, Programming the 8051 to transfer and to receive data serially, Importance of TI and RI flags, Baud rate doubling.	**11H, 15M**
UNIT -4	**Interrupts Programming** Interrupts in 8051, enabling and disabling the interrupts, Programming timer interrupts, Programming external hardware interrupts, Level and edge triggered interrupts.	**08H, 10M**
UNIT -5	**Unit 5: 8051 Interfacing** Interfacing of 8255 to 8051 & programming Introduction, Interfacing-keyboard (matrix), Displays (seven segment & LCD), Stepper motor, ADC, DAC (Sine wave & Square wave), Temperature Sensor (LM 35). Analog Comparator, Serial Peripheral Interface (SPI), Two Wire Interface (TWI) / I2C bus	**10H, 15M**
Suggested Readings	**Reference Books:** 1. "Introduction to Embedded System", Shibu K V, Tata McGraw Hill. 2. "Embedded Systems" Rajkamal, Tata McGraw Hill. 3. The 8051 Microcontroller and Embedded Systems", Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, Pearson Education. 4. "The 8051 Microcontroller Architecture, Programming, & Applications", Kenneth J. Ayala, Penram International. 5. "The 8051Microcontroller and Embedded System using Assembly and C", K. J. Ayala, D. V. Gadre, Cengage Learning, Indian Edition. 6. "Programming and Customizing the 8051, Microcontroller", Myke Predko, Tata McGraw Hill.	

DSC Elective Course (Any one)

ELE-606 (A) Electrodynamics

Total Hours: 45	**Credits: 3**

Course objective

- To enrich the understanding of fundamentals concepts of electrodynamics and electromagnetics.
- To have basic knowledge of electromagnetic waves and their propagation.

Learning outcomes

After successful completion of this course, students are expected to:

- Apply Gauss Law, Amperes Force Law, Lorentz's force, Biot-Savarts Law, Faraday's Law for solving the problems in Electrostatic and Electromagnetic Fields.
- Apply the principle of electrostatic to the solutions of problems related to electric field and electric potential, boundary value problem in electrostatic field.
- Understand the concept of Faradays law, Lenz's Law and Maxwell Equation
- Apply the Maxwell's equation in free space, linear isotropic media and varying fields, energy and electrostatic fields.

Unit	Topics	Lectures
UNIT-1	**Electrostatics** Electric Field, electric flux, Field lines, Gauss' Law (integral form, for an internal & external point), application of Gauss' Law (field due to spherically symmetric charge distribution), Introduction to electrostatic potential, electrostatic energy, relation between electric field and electrostatic potential, electrostatic Energy.	**10H, 12M**
UNIT-2	**Boundary Value Problems in Electrostatic Field** Poisson's and Laplace Equation, solution of Laplace's equation in rectangular coordinate, Laplace's equation in spherical polar coordinates, electrostatic potential energy, simple boundary value problem, electrostatic images, point charge and conducting sphere.	**06H, 10M**
UNIT-3	**Magnetostatics** Introduction, electric current, Steddy current, Ohm's law, electrical conductivity, calculation of resistance, current density, magnetic induction, force on a current element Amper's force law, Lorentz force and force on a current, Biot-Savart's law, simple applications. resistance and radiated power[6]	**08H, 10M**
UNIT-4	**Electromagnetic Induction** Electromotive force, Faraday's Law of electromagnetic induction, Inductance Energy in magnetic field , Lenz law, integral and differential form of Faraday's law, equation of continuity, displacement current, Maxwell's Equations (differential form), derivation of Maxwell's equations, Maxwell's equation in integral form and its derivation, Maxwell's equation in free space, linear isotropic media and varying fields, energy in electromagnetic fields: Poynting theorem.	**11H, 16M**
UNIT-5	**Electromagnetic Wave and its Propagation** Physical significance of wave equations for free space conditions and plane electromagnetic waves in free space (Cover figure of EM wave and E-H parameter on the basis of last equation, No derivation expected), plane electromagnetic wave propagation in isotropic dielectric (non conducting media), polarization of electromagnetic wave, reflection and refraction of EM wave at non conducting boundaries.	**10H, 12M** **30**

Suggested Readings	1. "Electrodynamics" Dr. Gupta, Dr. Kumar, Singh, Pragati Prakashan. 2. "Electromagnetics", B. B. Laud, Wiley Eastern Limited. 3. "Foundations of Electromagnetic Theory", John Reits, Narosa Publishing House. 4. "Classical Electrodynamics", John David Jackson, Wiley Student Education. 5. "Introduction to Electrodynamics", David J. Griffiths, Pearson Education India. 6. "Classical Electrodynamics", S. P. Puri, Tata McGraw Hill Publishing	

ELE-606 (B) Antennas and Wave propagation

Total Hours: 45 | **Credits: 3**

Course objective

- To provide fundamental knowledge of electromagnetic wave radiation and reception through antenna.
- To understand physical properties of antenna.
- To study different antenna structures
- To understand transmission of radio waves around the surface of earth.

Learning outcomes

After successful completion of this course, students are expected to:

- The student will be able to Understand how the electromagnetic wave propagate from an antenna
- Learn the concept of RF feeding to an antenna
- To calculate the various parameters of antenna to know its efficiency.
- Study the various types of antennas used in recent communication systems.
- Understand the wave propagation through space.

Unit	Topics	Lectures
UNIT-1	**FUNDAMENTALS OF ANTENNA** Introduction, Antenna radiation mechanism, Functions of antenna, Properties of antenna, Applications of Antenna Antenna Parameters : Radiation pattern- field pattern and phase pattern, Directive gain, Directivity and power gain, Field Intensity, Antenna Resistance, Bandwidth, Beam width , Polarization, Efficiency, Antenna temperature[1,3], Effective height and aparture[5] , FBR, Problems based on parameters.	**09 H, 12M**
UNIT-2	**TRANSMISSION LINES** Principal and types of transmission lines- Coaxial, Twisted pair, standing waves, Losses in transmission lines, Input impedance/characteristic impedance, Impedance matching [3].	**06H, 10M**
UNIT-3	**RADIATING STRUCTURES** Basic of Antenna Elements, Radiation of alternating current element, Radiated power and radiation resistance of AC element, Hertzian dipole, Radiation Induction and Electrostatic Field, Numerical on radiated resistance and radiated power[6]	**09H, 12M**
UNIT-4	**ANTENNAS** Monopole antenna, half wave dipole – current and voltage distribution Folded dipole, concept of Loop antenna and structures, Idea of Bioconical antenna, concept of Patch Antenna and its types, Aperture antenna, Array antenna, Parabolic Reflector antenna, List of antenna application	**09 H, 12M**
UNIT-5	**WAVE PROPAGATION** Fundamentals of electromagnetic wave-radiation absorption, Ground waves, Sky wave propagation- Ionosphere, Space waves, Tropospheric scatter propagation, wave propagation in ionosphere, Definition: Critical frequency, Skip distance, virtual height, Maximum Usable frequency; Wave propagation in mobile radio environment[4].	**12H, 14M**
Suggested Readings	1. Constatine A. Balanis. (2012) Antenna theory : Analysis and Design,3rd Edition, John Wiley & Sons 2. Sisir K Das & Annapurna Das.(2013)Antenna and wave propagation ,1st Edition, Tata Mcgraw Hill Publication 3. G. Kennedy.(1999) Electronic Communication systems,3rd Edition, Tata Mcgraw Hill Publication 4. Willian C. Y. Lee.(1986) Mobile communications design fundamentals, Willey Series in Telecommunication 5. R. L. Yadava.(2011)Antenna and wave propagation, 1st Edition, PHI Learning Private Limited. 6. G.S.N Raju.(2004)Antennas and Wave Propagation, 1st Edition, Pearson Education.	

DSC Core (Practical)	
ELE – 607: Practical Lab I	
Total Hours: 60	**Credits: 4**

A) **Power Electronics (Any four)**

1. Build and test DC to DC converter using transistor and IC-555.
2. Study of characteristics of SCR.
3. Study of characteristics of TRIAC.
4. Study of half wave/full wave rectifier using SCR.
5. Study of fan regulator/ light dimmer using Diac and TRIAC.
6. Study of time delay circuit using SCR and UJT.
7. Build and test over voltage protection using SCR for a given voltage.

Build and test triggering of SCR using LDR

B) Consumer Electronics (Any three)

1. Plot the Directional response of Microphone
2. Plot the directional response of a Loud Speaker
3. Installation of Public Address System.
4. Installation of CCTV system
5. Installation of Dish Antenna for best reception
6. Assembling of water purifier
7. Market Survey of Products (At least one from each module)
8. Installation of Printer
9. Identification of blocks of computer system and tracing the system.
10. Computer Assembling/Disassembling

Installation of operating system

C) Computer networking (Any three)

1. Study of Network components (To observe Components of Network in your Computer Network Lab and its type and network features)
2. Prepare a Straight Cable and Network Cross over Cable and test by Line Tester. (connecter connection is expected)
3. To Connect Computers in Star Topology using Wired Media and any Network control Device.
4. Preparing setting up wireless network
5. To connect two hubs/switch by creating crossover connection and to Configure Peer-to-Peer Network.
6. To Share Printer and Folder in Network.
7. Troubleshooting network
8. Preventive maintenance
9. Handling network admin function
10. To visit server room and prepare report on 1. Proxy Server 2. Server Configuration 3. Router Configuration 4. Firewall Configuration 5. Network setup details (Topology, Back up, IP range, network software, UPS)

ELE – 608: Practical Lab II

(µP, Embedded systems and Antenna & Wave propagation)

Total Hours: 60 **Credits: 4**

A) **Microprocessor Interfacing (Any five)**

1. Write a program to interface LEDs
2. Write a program to interface Switch and buzzer
3. Write a program to interface the Relay
4. Write a program to interface Keyboard matrix
5. Write a program to interface Seven Segment display
6. Write a program to drive stepper motor.
7. Write a program to interface DC motor
8. Write a program to interface LCD
9. Write a program to interface the IR Sensor
10. Write a program to interface the LDR
11. Interfacing ADC to 8086.
12. Interfacing DAC to 8086.

Note: Experiments to be performed on microprocessor 8086 trainer kit/ simulator

B) Embedded Systems Lab (Any five)

1. Write a program to make LED ON and OFF continuously.
2. Write a program to drive stepper motor continuously.
3. Write a program to generate square wave.
4. Use the potentiometer to change the red LED intensity from 0 to maximum in 256 steps.
5. Interface DC motor using L293D Motor Driver.
6. Write a program to interface Seven Segment display
7. Write a program to interface LCD
8. Interface LM35 temperature sensor and monitor temperature.
9. Write a program to add strings of byte and store in memory.
10. Write a program to count no. of character stored in string which is terminated by escape character.

Note:- Experiments to be performed on microcontroller 8051 trainer kit/simulator

C) Antenna and Wave Propagation

Perform the following experiments by simulation using MATLAB/SciLab

1) To study Antenna Parameters
   a. Radiation pattern b. Directivity c. Power Gain d. Power radiated e. Efficiency
2) Determine the radiated field strength and the total power radiated and also the radiation resistance.
3) Determine radiation pattern in loop antenna.
4) Determine field strength and induced voltage in loop.
5) Determine Gain, Bandwidth and capture area a parabolic reflector antenna for different diameters.

Determine loss and power received with varying frequency.

Note:

- Students offering course **ELE 606 (A) Electrodynamics** should perform any five practical from group A and group B. (Total 10 practical)
- Students offering course **ELE 606 (B) Antenna and wave Propagation** should perform any four practical from group A, and any three practical from group B & C. (Total 10 practical)

ELE – 609: Project Part II

Total Hours: 60 | **Credit: 4**

During project work, follow the following guidelines –

1. Title of the project must be well defined.
2. Planning of the project must be specified.
3. Aim, Objectives, Designing and theoretical background of the work should be specified in detail.
4. Actual work done must be reported along with experimental procedure.
5. There must be observations, results and conclusions of the project work.
6. In case of the projects related to the development of computer software algorithm, program strategy, module wise description etc. must be provided.
7. Applications of the work must be specified clearly.
8. Further extension / future scope of the work may be suggested for better outcome of the project.
9. References must be specified

Semester wise Planning & Evaluation of the project work

Work assigned	Marks	Total
1. Fabrication and Testing of the Project Circuit	20	60
2. Preparation of the Project Report	20	
3. Final Presentation of the Project	20	