UNIVERSITY OF PUNE
T.Y.B.Sc. Electronic Science
Revised Syllabus

To be implemented from June 2010

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1) Title of the course: Third Year B.Sc. Electronic Science

2) Introduction:

Semester Pattern is followed at S.Y.B.Sc. Electronic Science. Third year B.Sc. syllabus is designed to provide an insight into applications of various circuit blocks , design analog and digital systems, methods to analyze working of systems and some of consumer products. Training on system design and simulations, learning programming languages like "C" and tools like "MATLAB" is included. A course in Project work is maintained in new syllabus and a guideline for it is framed.

In the theory courses adequate knowledge of Analog systems design, digital system design, communication systems, basics of nanotechnology, nanoelectronics will be acquired by the students.

Student taking admission at T.Y.B.Sc. Electronic Science have to complete 12 theory courses six each semester, two practical courses (Annual) and one project course (Practical III, Annual). In the practical course of 100 marks there are compulsory experiments along with the one activity to be done for practical course I and II. The details are mentioned in the syllabus.

3) Aim and Objectives:

The aim of the course is to generate trained manpower with adequate theoretical and practical knowledge of the various facets of electronic circuits and systems. Due care is taken to inculcate conceptual understanding in basic phenomena, materials, devices, circuits and products and development of appropriate practical skills suitable for industrial needs. Following are the objectives –

i) To design the syllabus with specific focus on key Learning Areas.
ii) To equip student with necessary fundamental concepts and knowledge base.
iii) To develop specific practical skills.
iv) To impart training on circuit design, analysis , building and testing.
v) To prepare students for demonstrating the acquired knowledge.
vi) To encourage student to develop skills for accepting challenges of upcoming technological advancements.

4) Eligibility: Second Year B.Sc. Pass / ATKT , with all subjects cleared at F.Y.B.Sc.

5) Examination –

A) Pattern of Examination :

i) Semester III

Theory Papers – Six Theory papers of 50 marks per semester
(Internal examination 10 + Semester Examination 40, Total 50)

ii) Semester IV

Theory Papers – Six Theory papers of 50 marks per semester
(Internal examination 10 + Semester Examination 40, Total 50)

Practical - Three Practical courses, out of which Course III is Project work.

iii) Pattern of the question Paper:

The pattern adopted for theory and practical examination is as below.

Theory:

The topic wise weightage is decided as per lecture allotted to cover the syllabus for the topics. The Internal option is also taken into consideration in the process. Equal weightage is given for each topic. No topic can be given as optional.

Internal Examination 10 Marks

It is a continuous evaluation process and is executed by the teacher conducting the course.

Four types of questions –

Objective, Fill in the blanks, True or False and One Sentence Answer.

There are two or three different sets of the question papers used for internal examination in the same class for same paper.

External Examination 40 Marks

Pattern is as follows-

Q.1 Answer all of the following : 12 marks

Compulsory no internal option , contains one mark , two mark objective and numerical questions.

Q.2 Answer any TWO. : 08 marks

Three questions are given, each having 4 marks, any two are to be solved.

Q.3 Answer any TWO. : 08 marks

Three questions are given, each having 4 marks, any two are to be solved.

Q.4 Answer any TWO. : 12 marks

Three questions are given, each having 6 marks, any two are to be solved.

There is complete option question for Q.4 having three compulsory numerical problems having weightage of 4 marks each.

Practical :

Internal Marks 20 :

Continuous assessment

External Examination 80 Marks.

Have to perform 2 experiments of 40 marks of the duration 3 hours each.

(Practical Examination is scheduled in two sessions.)

B) Standard of passing:

Candidate must score 40% marks at the semester examination in each course. **i.e. 16 marks at semester theory paper and 32 marks at the practical course**. There is no separate passing for internal course, however the total marks of internal and external should be 40% of the total marks to be awarded.

C) ATKT Rules: As per University rules.

D) Award of Class:

Overall class at Third Year B.Sc. Electronic Science will as per University rules as follows –

- Above 70% First class with distinction
- Between 60% to 70% First Class
- Between 50% to 60% Second Class
- From 40% to 50 % Pass class.

However the marks in the Electronic Science papers at Second Year B.Sc. course will be taken into account, for awarding the ultimate class of the course at T.Y.B.Sc.

E) External Students:
Not applicable for this course. External Students are not allowed.

F) Setting of Questions paper/ Pattern of Question paper:
Setting of the question paper is as per University Schedule and it is centralized system adopted by University of Pune. Pattern of question paper will be as per decided by Board of Electronic Science, University of Pune.

G) Verification of Revaluation: As per University Statutes and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Structure of the course : Total six Theory in each semester and Three Practical courses.

i) a) Compulsory Paper : Five theory papers in Semester III and Semester IV

b) Optional Paper : One (Paper VI)

Course Structure

Paper	Semester – III		Semester – IV	
Paper - I	EL - 331	Advanced Digital system design	EL - 341	Advanced Communication systems
Paper – II	EL - 332	Microcontrollers	EL - 342	Embedded systems
Paper – III	EL – 333	Analog Circuit Design and Application of Linear IC's	EL – 343	Power Electronics
Paper – IV	EL – 334	Foundation of Nanoelectronics	EL – 344	Electronic Materials And Devices
Paper – V	EL – 335	'C' -Programming	EL – 345	Mathematical Methods and Analysis using MATLAB
Paper -VI	EL -336 A) B)	Optional Course Fiber Optics and fiber optic Communication Sensor & Actuators	EL- 346 A) B)	Optional Course Instrumentation Consumer Electronics
Paper - VII	EL – 347	Practical Course- I		
Paper – VIII	EL – 348	Practical Course- II		
Paper - IX	EL- 349	Practical Course- III (Project Course)		

Note : Vocational courses will be substituted in place of PAPER V AND VI

c) Question paper : <u>Theory -</u>

- **For Internal Examination 10 Marks**
- **For Semester Examination 40 Marks**

<u>Practical-</u>

- **For Internal Examination 20 Marks**
- **For Semester Examination 80 Marks**

ii) Medium and Instructions: ENGLISH

7) Equivalence subject/Paper and Transitory Provision:

T.Y.B.Sc. Electronic Science Semester III

OLD Syllabus			NEW Syllabus	
Paper-I	**EL-331**	Analog circuits and systems	EL – 333	Analog Circuit Design and Application of Linear IC's
Paper-II	**EL-332**	Micro-controllers	EL - 332	Microcontrollers
Paper-III	**EL-333**	Modeling & Simulation using C & MATLAB	EL – 335	C Programming
Paper-IV	**EL-334**	Electromagnetic fields and Waves	EL – 334	Foundation of Nanoelectronics
Paper-V	**EL-335**	Optional Course -I		
	A)	Power Electronics -I	EL – 343	Power Electronics
	B)	Principles & Applications of Sensors-I	EL – 336 B	Sensor & Actuators
	C)	Industrial Electronics –I	EL – 343 A	Power Electronics
	D)	Computer Service Management	EL – 346 B	Consumer Electronics
	E)	Electronic Equipment Troubleshooting & repairs	EL – 346 B	Consumer Electronics
Paper-VI	**EL-336**	Optional Course - II		
	A)	Computer Hardware	EL 336 A	Fiber Optics and fiber optic communication
	B)	Computer Network design & Maintenance	EL 336 A	Fiber Optics and fiber optic communication
	C)	Biomedical Instrumentation-I	EL -336 A	Fiber Optics and fiber optic communication
	D)	Industrial Electronics -I	EL – 336 A	Fiber Optics and fiber optic communication
	E)	Agri Electronics –I	EL – 336 A	Fiber Optics and fiber optic communication
	F)	Fiber optics & Fiber optic Communication-I	EL – 336 A	Fiber Optics and fiber optic Communication
Paper-VII	EL-347	Practical Course –I	EL-347	Practical Course –I
Paper-VIII	EL-348	Practical Course –II	EL-348	Practical Course –II
Paper-IX	EL-349	Practical Course –III (Project Course)	EL-349	Practical Course –III (Project Course)

T.Y.B.Sc. Electronic Science Semester IV

OLD Syllabus			NEW Syllabus	
Paper-I	**EL-341**	Digital circuits and systems	EL - 331	Advanced Digital syster design
Paper-II	**EL-342**	Process Automation	EL- 342	Embedded Systems
Paper-III	**EL-343**	Modeling & Simulation: Applications in Electronics	EL – 345	Mathematical Methods and Analysis using Mat
Paper-IV	**EL-344**	Physics of Electronic Materials	EL – 344	Electronic Materials And Devices
Paper -V	**EL-345**	Optional Course – I		
	A)	Power Electronics -II	EL – 346 B	Consumer Electronics
	B)	Principles & Applications of Sensors-II	EL – 336 B	Consumer Electronics
	C)	Industrial electronics -II	EL – 346 B	Consumer Electronics
	D)	Entrepreneurship development	EL – 346 B	Consumer Electronics
	E)	Entrepreneurship development	EL – 346 B	Consumer Electronics
Paper-VI	**EL-346**	Optional Course –II		
	A)	Computer Networking	EL- 341	Advanced Communicati Systemss
	B)	Network Operating System	EL- 341	Advanced Communicati Systemss
	C)	Biomedical Instrumentation-II	EL- 341	Advanced Communicati Systemss
	D)	Medical Instrumentation	EL- 341	Advanced Communicati Systemss
	E)	Agrielectronics –II	EL- 341	Advanced Communicati Systemss
	F)	Fiber optics & Fiber optic Communication-II	EL – 341	Advanced Communicati Systemss
Paper-VII	EL-347	Practical Course –I	EL-347	Practical Course –I
Paper-VIII	EL-348	Practical Course –II	EL-348	Practical Course –II
Paper-IX	EL-349	Practical Course –III (Project Course)	EL-349	Practical Course –III (Project Course)

8) University Terms:

- **More than 75% attendance is necessary for the course as per University rules.**
- **12 Weeks will be available for completion of theory course.**
- **Practical course I , II and III (Project work) will be throughout the year.**

9) Subject wise Detail Syllabus and Recommended books:

Paper I : Semester III

EL -331 : Advanced Digital System Design

Learning Objectives:

1. Become familiar with digital system concept and designing steps/methods.
2. Understand and design sequential digital circuits with various aspects.
3. Learn advanced methods for digital system design.
4. Understand designing using VHDL in digital systems.
5. Study various case studies in digital system design.

1.	**Concepts of digital system design**	**06**
	Digital system, digital systems design process, Methodology, Types of logic circuits.	
2.	**Sequential circuit design**	**10**
	Introduction, State equivalence, state reduction, state assignment techniques, along with state machines, sequential machine	
3.	**Asynchronous Sequential Circuits**	**12**
	Introduction to asynchronous sequential machine, Fundamental and pulse mode asynchronous machine, analyzing asynchronous machine, deriving flow tables, state assignment, asynchronous design problems, data synchronizers, mixed operating mode asynchronous circuits.	
4.	**Programmable logic design**	**08**
	Introduction to reconfigurable logic ,PLD, SPLD, PAL, CPLD's, FPGA.	
5.	**Introduction to VHDL**	**06**
	Design entity synthesis, verification and implementation using E-cad tools	
6.	**Case study**	**06**
	Traffic light controller, Stepper motor sequence generator, Rolling display, Tablet filling system.	

Recommended Books:

1	Stephen Brown , Zvonko Vranesic	Fundamental of digital logic with VHDL	Tata McGraw hill
2	John M. Yarbrough	Digital logic: Applications and design	Cengage Learning India (Thompson)
3	Floyd , Thoms L., Jain R.P.	Digital fundamentals	Pearson Education (Singapore) Pte.Ltd.
4	Bhaskar	VHDL Design	

Paper II : Semester III
EL -332 Course: Microcontrollers

Learning Objectives:

1. Explain the difference between microprocessor and microcontrollers
2. Describe the architecture of 8 bit microcontroller
3. Use the instruction set and addressing modes of microcontroller
3. Develop assembly language programming skills
4. Interface various memory and I/O devices

1.	**Microcontroller Architecture**	**10**
	8051 Microcontroller Hardware (Oscillator & Clock, Program Counter, Data Pointer, A and B Registers, Flags and PSW, Internal Memory, Internal RAM/ROM, Stack & Stack Pointer, SFRs). I/O ports, External Memory , Counters and Timers, Serial I/O Interrupts, External Memory Interfacing derivatives of 8x51: 8751, 8752, 89C51, 89S52.	
2.	**Instruction Set**	**12**
	Addressing Modes, Different Groups of Instructions-Data Transfer Instructions, Logical Operation, Arithmetic Operations, Jump and Call Instructions	
3.	**Programming and Development tools**	**06**
	Algorithms, Flow Charts, Program Designing, Editors, Assemblers, Compilers, Linkers, Cross Compilers, Simulators, Debugger, Emulators	
4.	**Simple Program**	**08**
	Arithmetic, Logical, Code Conversion, Block Data Transfer & Timer Programming.	
5.	**Interfacing Memory and I/O devices**	**12**
	RAM , ROM ,Switches, LEDs, Keyboards, Displays-7 Segment, LCD, DAC, ADC, Stepper Motor, PWM drive for DC Motor, Thumb Wheel Switches.	

Recommended Books:

1	Kenneth J. Ayala	The 8051 Microcontroller, Architecture, Programming and Application [Second Edition]	Penram International, (1999).
2	M.A. Mazidi, J. G. Mazidi, R.D. Mckinlay	The 8051 Microcontroller And Embedded Systems, Using Assembly and C	Pearson Education , Second Edition (2009)
3.	Kenneth J. Ayala, Dhanjay V. Gadre	The 8051 Microcontroller And Embedded Systems, Using Assembly and C	Cengage Learning
4	Deshmukh Ajay V.	Microcontrollers [Theory and Applications]	TMH

Paper III : Semester III

EL -333 Analog System Design and Applications of Linear IC's

Learning Objectives:

1. Understand analog system design concepts
2. Learn the specifications and selection criterion for linear ICs
3. Design analog electronic circuit for given specifications.
4. Obtain information about different special purpose ICs and their applications
5. Refer and understand data manuals..

1.	**Analog circuit design concepts- I**	**02**
	Construction aspects of analog systems: Systems requirements based on signal source, Shielding ,guarding, and grounding techniques , Design of cabinet and other aspects, cabling systems, user interface, installation of systems.	
2.	**Analog circuit design concepts – II**	**14**
	Types, specifications and selection criterion for Op Amp ICs , Design of inverting and non – inverting amplifier circuits for a given gain, input and output impedance and bandwidth. Selection of Op – amps for given design. Practical integrator and differentiator circuit and their design. Consideration of stability and noise in differentiator circuits. Steps to design practical differentiator circuit. Applications of integrator and differentiator circuits. Design of Practical log and antilog amplifiers. Considerations regarding temperature effects offsets and stability. Application such as multiplier / divider circuit, true rms to dc converter etc.	
3.	**Applications of Linear ICs – I**	**06**
	Design of peak detector circuit. Design of Practical S/H circuits using two Op – Amps. Consideration of speed as well as accuracy. Applications in data acquisition. Design of precision rectifier circuits and application. Precise full wave rectifiers with equal resistor and one with high input impedance.	
4.	**Applications of Linear ICs - II**	**12**
	Wave Shaping Circuits, Clipping and Clamping Circuits using Op-amp. Design aspects regarding speed and accuracy. Design of astable and mono stable (slew rate) . Multivibrators using op-amp and timer IC555. Function generator (using square and sine wave), op-amp and Ic's, such as 8038, XR2206, LM 566. Voltage to frequency and frequency to voltage converter. IC LM 331. voltage comparator ICs LM311, micro power comparator, LMC 6762 (National), Schmitt trigger, design and application in ON-OFF controller, quadrature oscillators.	
5.	**Applications of Linear ICs - III**	**14**
	Linear Regulator ICs LM723, LM317 and three terminal regulators ICs-78XX,79XX, LM723 (Low and high voltage regulators), with and without external pass transistors, shunt . Voltage reference ICs LM10, LM129. Active filters of 2^{nd} and higher order. Design of LP, HP and BP filters for 2^{nd} order, Active filter Ics : Linear AF 100, AF 150 or equivalent. Switched capacitor filters : Concept and applications. SC filter ICs MF 10, MF 4 etc.	

Recommended Books:

1	George Clayton	Operational Amplifiers, 5th Edition	Newnes Imprint of Elsevier
2	Sergi Franco	Design With operational Amplifiers and analog integrated circuits	Tata McGraw Hill
3	Ramakant A. Gayakwad	Op-Amps and Linear Integrated Circuits, 4th Edition	Prentice- Hall India Pvt. Ltd.
4	Coughlin Driscoll	Linear IC Data books	
5	oman L Floyd	Electronic Devices	McGraw Hill Companies
6	James M Fiore	Operational Amplifiers and Linear Integrated Circuits	Jaico Publishing house.
7	Anwar A. Khan	A First course in electronics	Prentice-Hall of India Pvt. Ltd.

Paper IV : Semester III
EL -334 Foundation of Nanoelectronics

Learning Objectives:

1. To know methods of quantum mechanics for nanoelectronics.
2. To know statistical mechanics to be used in nanotechnology.
3. To understand basics of electromagnetic and its application s
4. To study some of the applications in nanoelectronics.

1.	**Introduction to Nanoelectronics**	**10**
	Top down approach, Bottom up approach, Importance of nanoelectronics. Particles and Waves: Classical particles, Classical waves, Uncertainty principle, Wave-particle duality, Wave mechanics: The Schrödinger wave equation , wave mechanics of particles , Infinite potential well, qualitative treatment of square wave potential with special reference to tunneling phenomenon, atoms and atomic orbital.	
2.	**Statistical aspects for nanotechnology**	**10**
	Classical statistics, Gaussian distribution , Poisson distribution , Fermi-Dirac , Bose Einstein , Maxwell Boltzmann statistics , Time and length scales of the electrons in solids, statistics of electrons in solids and nanostructures, Density of states of electrons, electron transport, Conductivity of metals	
3.	**Essential Electromagnetics for nanotechnology**	**16**
	Lorentz force-Motion of charged particle in E-M fields , cyclotron , Hall effect. Maxwell's equations, Relation with laws of Electrodynamics, Equation of continuity , Poyinting vector theorem , Wave equation for E and H, properties of EM waves in conducting , nonconducting media , Frequency range of EM waves and their significance, Skin depth, polarization – plane, circular, elliptical polarization, reflection and refraction of EM wave from boundary of two dielectrics , Brewster angle , critical angle.	
4.	**Applications**	**12**
	Nanostructure devices like resonant-tunneling diode, electrons in quantum wells, electrons in quantum wire, electrons in quantum dots, Flash Memory .	

Recommended Books:

1	George W. Hanson	'Fundamentals of nanoelectronics",	LPE, Pearson Education
2	Mitin , Viatcheslav A. Kochelap , Michael A. Stroscio Vladimir	"Introduction to Nanoelectronics Science , nanotechnology , Engineering and Applications"	Cambridge University Press 2008
3	Ben G. Streetman , Sanjaykumar Banerjee	"Solid State Electronic Devices ", 6th Edition	
4	Kraus and Fleisch	"Electromagnetics with applications"	McGraw Hill, 5th edition
5	Donald A.Neaman,	"Semiconductor Physics and devices" 3rd edition	TMH

Paper V : Semester III
EL -335 ‘ C ’- Programming

Learning Objectives:

1. To understand fundamentals of C language.
2. To develop algorithm/flowcharts for problem solving and writing programs.
3. To learn to use functions, arrays, pointers and file handling in C language.
4. To study Graphics in C.

Teaching Method:

1) This course may be taught in classroom and computer laboratory simultaneously.
2) No separate practical are to be conducted for this course.
3) Exercises/programs (or equivalent) from this course are to be demonstrated on PC.
4) Equipped computer laboratory with sufficient number of computers is to be made available for teaching of this course along with projector facility.

1.	**C- Fundamentals**	**14**
	Introduction, character set, constants and variables, Key words, Symbolic constant, statements, entering and executing C program, input and output simple and formatted functions, operators and expressions, control structures and loops and exercises 1. To obtain solution of second order quadratic equation 2. To print first 10 natural numbers. 3. Convert Decimal to Binary numbers. 4. To generate Fibonacci Sequence upto ten terms.. 5. To find equivalent resistance of series / parallel combination of resistive circuits or equivalent capacitance of capacitor combination circuit.	
2.	**Functions**	**08**
	Defining a function, Accessing a function, function prototype, passing argument, recursion e.g. 1. To find a factorial of a number using function and recursion. 2. Display of message using function. 3. To find sum of digits of a given integer using function & recursion …. and similar	
3.	**Arrays and Pointers**	**12**
	Defining and processing of an array, passing array to a function, Pointers declarations, passing pointers to a function, operations of Pointers, pointers as function parameters 1. To print sum of an array elements. 2. To find addition subtraction of two matrices. 3. To find multiplication of two matrices 4. To find Inverse of matrix.	
4.	**Structures and Data Files**	**08**
	Defining and processing of a structure, user define data types, opening and closing of data file, read and write data file, processing data file. 1. To determine a size of structure. 2. Writing to a data file.	

	3. To read the contents of data file and display it on the screen. 4. To arrange the no. store in data file. 5. To copying the data file.	
5.	**Graphics in C**	**06**
	Introduction, Graphics in C, Text Mode, Graphics mode, Animation. 1. To display text using function. 2. To draw a line, circle, triangle, square and ellipse and fill with different colors. 3. To draw electronic circuit symbols.(Resistor, Capacitor, Inductor, Diode, BJT, FET, UJT, OP-AMP, IC.	

Recommended Books:

1	J. Jayasri	The 'C Language Trainer with C Graphics and C++	WILEY
2	Byron. S. Gottfried	Schaum's Outline of Programming with C	TMH
3	E Balaguruswamy	Programming in –C	BPB
4	Stephens Cochan	Programming in C	Prentice hall of India Ltd
5	V. Rajaraman	Computer Programming in C	Prentice hall of India Ltd.
6	Madhusudan Mothe	C for Beginner	Shroff

Paper I : Semester IV

EL- 341 Advanced Communication Systems

Learning Objectives :

1. To understand the parameters of Antenna
2. To study modulation and demodulation techniques.
3. To understand working of Transmitters and Receivers.
4. To get familiarize with Digital Communication

1.	**Antenna**	**12**
	Maxwell's Equations and their interpretations, Wave equation and its solution, Poynting vector theorem, Application of Poynting theorem-power dissipated. Basics of antenna:concept of radiation, parameters, evaluations for lambda/2 antenna, Interpretation of near and far field, Types of antenna, their dimensions, radiation pattern, frequency range, introduction to Propagation media	
2.	**Modulation and demodulation techniques**	**10**
	Balanced modulator, SSBSC with derivations, Synchronous demodulation, Phase modulation and demodulation using PLL, Ratio detector, Quadrature detector, Comparative study of different modulation demodulation techniques	
3.	**Transmitter**	**10**
	FM transmitter-block diagram AM Transmitter, Transmitters in high frequency range (Block diagram), Overview of RF amplifier from low frequency to GHz. , RF generator(Klystron generator), RF amplifier design-Bluetooth application(2.4GHz),Impedance matching cable specifications for high power Frequency Translation and multiplication, up/down conversion , Case study of typical transmitters- Radio Transmitter , TV Transmitter	
4.	**Receivers**	**06**
	Mobile receiver block diagram (800MHz),Doppler radar /speed gun block diagram (24 GHz) Introduction to low noise amplifier with block diagram	
5.	**Digital Communication**	**10**
	Sampling Theorem-diagrammatic explanation, Aliasing effect and anti-aliasing filters Delta modulation, Adaptive delta modulation, PCM and demodulation, Binary PSK, Differential PSK, Differential encoded PSK, QPSK, QASK, Binary FSK ,FDM and TDM – Block diagram and ICs. Case study : Campus Wi Fi system , Digital Communication system	

Recommended Books:

1	Roddy Coolen	Electronic Communication (4th edition) 2005	PHI
2	Kennedy	Electronic Communication systems (3rd edition)2003	TMH
3	Kraus	Antennas (3rd edition) 2009	TMH
4	Balanis	Antenna Theory (2nd edition) 2009	Wiley Eastern
5	Taub Schilling	Principles of communication systems (2nd edition)	McGraw Hill
6	Kraus	Electromagnetic with applications (3rd edition) 1999	by McGraw Hill

Paper II : Semester IV

EL- 342 Embedded Systems

Learning Objectives:

1. Use C language for programming the microcontrollers
2. Learn to use Timers and Serial Communications systems
3. Develop a target board for an 8051 based embedded system
4. Apply the knowledge in real world applications and learn different case studies

1.	**Microcontroller Programming in C**	**16**
	C Data types for 8051, C Programs for Time Delays & I/O Operation, I/O Bit Manipulation, Arithmetic And Logical Operations, ASCII & BCD Data Conversion.	
2.	**Timer Programming in C**	**04**
	Timers and counters **,** delay generation using timer , waveform generation using timer , PWM based DC motor control ,frequency measurement using counter	
3.	**Serial Data Transfer Using C**	**06**
	8051 Connection to RS 232,RS 232 – RS 485 conversion , Serial Port Programming in C, Serial Data Transfer to Microcontroller from PC.	
4.	**Microcontroller based System Design**	**08**
	Hardware/Target Board Designing, System Software Designing, Hardware-Software Co-Design Keyboard, Display and External Memory Interfacing	
5.	**Case Studies**	**14**
	(i) Temperature measurement system consisting of sensor ,Voltage to Current converter , and current to voltage converter, ADC and Display unit. (ii) Traffic Light System (iii) RTC, (iv) Frequency Counter and Measurement , (v) Object Counter (vi) Computer Communication Using RS 232 , (vii) Light Sensor for Robot (viii) Water Level Controller	

Recommended Books:

1	Kenneth J. Ayala	The 8051 Microcontroller, Architecture, Programming And Application [Second Edition]	Penram International, (1999).
2	M.A. Mazidi, J. G. Mazidi, R.D. Mckinlay	The 8051 Microcontroller And Embedded Systems, Using Assembly and C ,Second Edition (2009)	Pearson Education

Paper III : Semester IV

EL - 343 Power Electronics

Learning Objectives:

1. To learn about Power Electronic Devices and their characteristics.
2. To study simple Power circuits and their performance parameters.
3. To learn different control techniques and applications of Power Circuits as case studies.
4. To understand Safety Measures, Protections and Measurements.

Note: Scope of the syllabus is limited to single phase circuit unless otherwise specified.

1.	**Introduction to Power Electronics**	**03**
	Concept of single phase and three phase using phasors, Single phase , 3 phase transformers , power transformer ,Power diodes, Power transistors and Thyristors (SCRs): Symbols and Characteristics, Concept of Power circuits using block diagram.	
2.	**Diodes and Rectifiers**	**04**
	Shockley equation of Diode, Reverse recovery characteristics Single phase rectifiers: Performance parameters, Half wave, Full wave centre tapped and bridge rectifier with resistive and inductive loads DC Filters: concept of C, L and LC filters	
3.	**Power transistors, DC Choppers and transistorized PWM inverter**	**06**
	Switching Characteristics: Power BJT, power MOSFET, IGBT Choppers: Step-up, Step-down, Class A, B, C, D,E choppers (No Circuit details) Regulators: Buck, Boost and Buck-boost Invertors: Performance parameters, principle, Half Bridge and full Bridge inverter, Voltage control methods, Inverter filters	
4.	**Thyristers, AC to DC and DC to AC Converters Static Switches**	**12**
	SCR characteristics, Two transistor static and transient model, turn-on, turn-off characteristics, dv/dt and di/dt protection Single phase Controlled rectifiers: Principle, Semi, Full and Dual Converters AC voltage controllers: on-off control, Phase angle control, Bi-directional control with Resistive and Inductive load, Cycloconverter DC Switches, Solid state relays, AC Switches and Microelectronic relays	
5.	**Safety Measures, Protection Devices and Measurement instruments**	**08**
	Electric Shock, safety in home and outdoors, Grounding systems, Undesirable circuit conditions, Fuses, Circuit breakers, thermal overload protections, lightening rods and arresters, High voltage probe, Differential probe, Clamp-on meter, Hall-sensor current meter, Power meters and energy meter, power factor measurement	
6.	**Case Studies**	**15**
	Concept, Block diagram, Circuit identification, typical specifications, Design consideration and application specific selection criteria for:- SMPS, DC motor drive, Spike guard, Inverter, AC voltage stabilizer, Home protector, UPS and CVT.	

Recommended Books:

1	M.H. Rashid	Power electronics: Circuits, Devices and Applications , third Edition (2004)	Pearson Education
2	Frank D Petruzella, MacMillan	Essentials of Electronics A survey	McGraw Hill (1993)
3	O.P. Arora	Power electronics Laboratory : theory , Practice & Organization	Narosa Publishing house (2007)
4	Mohan , undeland, Robbins	Power Electronics , Third Edition (2006)	John Wiley & Sons
5	P.C. Sen	Power Electronics	Tata Mc Graw Hill, (1998)

Paper IV : Semester IV
EL 344 Electronic Materials and Devices

Learning Objectives :

1. Understand different properties of materials.
2. Study some electronic applications based on these properties.
3. Understand fundamentals of nano-materials in general.
4. Learn structure of different electronic devices.

1.	**Overview of electronic materials**	**08**
	Conducting materials, Special purpose materials , insulating materials , Dielectrics and Alloys , Magnetic materials , polymers and conducting polymers.	
2.	**Dielectric materials and Insulation**	**12**
	Polarization, relative permittivity definition of dipole moment and electric polarization , polarization vector P , local field Clausius-Massoti equation , electronic polarization , covalent solids. Polarization Mechanisms: ionic polarization , orientational polarization , interfacial polarization , total polarization , frequency dependence of dielectric constant, real and imaginary parts of dielectric constants ,dielectric loss , dielectric strength , dielectric breakdown and partial discharges in gases , liquids and solids. Capacitor dielectric materials : Typical capacitor construction , dielectric comparison , Piezoelectricity , Ferro-electricity and Pyro-elcetricity , quartz oscillators and filters ,Ferro-electric and Pyro-electric crystals.	
3.	**Materials for nanoelectronics**	**12**
	Semiconductors, crystal lattices with bonding in crystals, concept of doping , electron energy bands, Semiconductor heterostructures , lattice-matched and pseudomorphic heterostructures , organic semiconductors , carbon nanomaterials , nanotubes and fullerenes	
4.	**Devices**	**16**
	Theory of ideal p-n junction with and without bias , band diagram with and without bias ,depletion layer capacitance , semiconductor contact- Ohmic and Schottky contacts , Schotkky diode , constructional theory and working principle of Photodiode , JFET , MOSFET with corresponding band diagrams, I-V characteristics. Nanostructure devices : Resonant-tunneling diodes, Field effect transistors, single electron transfer devices , potential effect transistors, light emitting diodes and lasers, Nanoelectromechanical system devices , quantum-dot cellular automata.	

Recommended Books:

1	S.M. Dheer	"Electronic components and materials"	Tata McGraw Hill (2000)
2	Vladimir V. Mitin , Viatcheslav A. Kochelap , Michael A. Stroscio	"Introduction to Nanoelectronics Science , nanotechnology , Engineering and Applications"	Cambridge University Press 2008
3	Ben G. Streetman , Sanjaykumar Banerjee	"Solid State Electronic Devices ", 6th Edition	
4	S.O. Kasap	Principles of Electronic Materials and Devices	Tata McGraw Hill.
5	Donald A. Neaman	Semiconductor Physics and Devices	TMH
6	S.M. Sze	Semiconductor devices	

Paper V : Semester IV

EL- 345 Mathematical Methods and Analysis using MATLAB

Learning Objectives :

1) To learn features of MATLAB as a programming tool.
2) To promote new teaching model that will help to develop programming skills and technique to solve mathematical problems.
3) To understand Laplace Transform and Fourier series and its applications.
4) To use MATLAB as a simulation tool.

Teaching Methods

1) This course should be taught in classroom and computer laboratory simultaneously.
2) No separate practical are to be conducted for this course.
3) Exercises /programs (or equivalent) from this course are to be demonstrated using computer.
4) Equipped computer laboratory with sufficient number of computers is to be made available for teaching of this course along with projector facility.

1.	**Introduction to MATLAB and Graphics**	**12**
	Preliminary, workspace, variables, simple arithmetic problems, symbolic calculations. Matrices, Vectors operations, Operators. Introduction to graphics: 2-D and 3 D plots, types & features, overlays, scripts and functions, M-files, special function variable sloops, branch, control, flow statements, structures and cells. File handling, input and output.	
2.	**Laplace Transform and its applications**	**12**
	Signals and systems: continuous time and discrete time signals. Laplace Transform: definition, Laplace transform of simple function, properties of LT(linearity, shifting, change of scale), Inverse LT, partial fraction technique to find Inv of LT transfer functions **Applications.** 1. Series RC circuit, RL circuit, RLC circuit, 2. Poles and Zeros stability criteria, Low pass and High pass filter. **MATLAB Exercises:** 1. CT and DT signals plotting 2. To find Laplace Transform and ILT of any given function. 3. RC / RL/RLC (series) circuit analysis per DC input 4. Transfer Function, Pole and Zero stability criteria and filters	
3.	**Fourier Series and Transform**	**08**
	Fourier Series Definition, Evaluation of Fourier Co–efficient, Fourier series for Square, Triangular, Half Wave, Full wave rectifiers, Fourier Transform: Definition and examples. **MATLAB Exercises:** 1. To evaluate Fourier Co–efficient for given waveform Function. 2. To find Fourier Transform for given function.	
4.	**Mathematical Application**	**10**
	Solution of differential equation using separation of variable method(Laplace, Poisson and Schrödinger equations in Cartesian co-ordinate system), Curve fitting(Straight line, Exponential &Cubic Spline) and its application to 1. Diode characteristics 2.Ohm's Law 3. Filters, Phasors as per AC circuits **MATLAB Exercises:** 1. Real root of algebraic equation, curve fitting 2. Diode/BJT characteristics, Ohm's law, filters performance.	

Recommended Books:

1	G K Mittal	Network Analysis	Khanna Publishers , New Delhi
2	Van Valkenberg	Network Analysis, 3rd Edition	Dorling Kindersley (India) Pvt Ltd
3	Umesh Sinha	Network Analysis and Synthesis	Satya Prakashan, Delhi.
4	Rudra Pratap	Getting Started with MATLAB , 7th Edition	Oxford University Press N Delhi
5	Amos Gilat	MATLAB : An introduction with applications	Wiley India
6	Stephen J. Chapman	MATLAB Programming For Engineers.	Thomas Learning

Paper VI : Semester III

OPTIONAL COURSES

EL 336-A Fiber Optics and fiber optic Communication

Learning Objectives :

1. To understand the principles of fiber optic communication system.
2. To learn the structure and fabrication techniques of optical fibers.
3. To understand essential optical components of Fiber Optic Communication
4. To study the applications of fiber optic communication systems

1.	**Introduction**	**06**
	Block diagram of fiber optic communication system. Need: Fiber optics in telephony, Voice communication, Video communication, Data Transfer, Entertainment, Power System, Transportation, Health care, Internet, Military Defense, business Development, Education. Definition and terminologies of fiber optic communication system: Bit rate, Baud rate, bandwidth, Channel capacity, Power calculation	
2.	**Fiber optics**	**14**
	Basic structure of optical fiber, ray transmission theory, propagation of light in optical fiber, acceptance angle, numerical aperture, skew rays, Dispersion in optical fiber. Types and specification of single mode, multimode, step index, graded index, glass and plastic fibers and advanced optical fiber. Fabrication Techniques: Preform formation by External CVD, Internal CVD, AVD, multielement glass, double crucible method, rod in tube method, fiber drawing and coating. Introduction to cabling: Fiber cable construction, Strength member, single fiber and multifiber cables, Selection criteria, optical fiber laying in Telephones	
3.	**Optical sources and detectors**	**06**
	LED and LASER diode, Principles of operation, concepts of line-width, phase noise, switching and modulation characteristics-typical LED and LD structures PN detector, PIN detector, avalanche photodiode-principles of operation, concepts of responsivity, sensitivity and quantum efficiency	
4.	**Fiber optic link Losses**	**06**
	Attenuation in optical fibers, material or impurity losses, scattering losses, absorption losses, bending losses. Fiber optic link structure and link losses, connector and splicing losses	
5.	**Fiber optic communication link design**	**10**
	Coupling mechanism of optical power from source to fiber and fiber to photo detector, transmission characteristics of fibers and their effects on system performance, selection of optical fiber types for short haul ,long haul and high speed data links, optical power and dispersion budget calculations of fiber optic communication link, Repeaters, optical amplifier principles	
6.	**Applications**	**06**
	Video link(fiber optical), satellite link, computer link - LAN, community Antenna Television(CATV), Switched star CATV networking, Digital video transmissions optical fiber networks, Optical fiber in Cellular telephony, Long haul communication for Internetworking, undersea optical fiber networks.	

Recommended Books:

1	G. Kaiser	Optical fiber communication	McGraw Hill
2	Subir kumar Sarkar	Optical fibers and fiber optic communication systems	S.Chand and company
3	R. P. Khare	Fiber optics and optoelectronics	Oxford University Press
4	John M. Senior	Optical fiber communications Principles and Practice , (2nd edition)	PHI
5	Ajoy Ghatak and K. Thyagarajan	Introduction to fiber optics	Cambridge University Press
6	D. C. Agarwal	Fiber optic communication	Wheeler publication

Paper VI : Semester III

OPTIONAL COURSES

EL 336-B Sensors and Actuators

Learning Objectives :

1. To study basic performance parameters and applications of sensors.
2. To understand various types of sensors along with their working principles and specifications
3. To learn the principle, construction and working of various actuators.
4. To design signal conditioning circuits for sensors.

1.	**Basics of Sensors**	**04**
	Need of sensors , Definition, Types of sensors, Classification, Principle, input-output parameters, Examples of devices, Specification and performance parameters, Accuracy ,Resolution, Threshold, impedance, Sensitivity, Hysteresis, Linearity, Range, Reliability, Selectivity	
2.	**Typical Sensors**	**14**
	Principle, Construction, Working and specifications of Thermal, Optical, Electrical, Magnetic, Chemical, Mechanical Sensors. Thermal Sensors: Thermometer, Thermister, Thermocouple, Pyroelectric, PT-100, junction semiconductor Optical Sensors: Photo detectors, Photovoltaic, optical encoders Mechanical and electromechanical: Strain gauges, LVDT, Inductive accelerometer, Ultrasonic Magnetic Sensors: Hall effect, variable inductance, eddy current sensors, electromagnetic flow meters Chemical Sensors: Gas, Humidity and pH measurement sensors	
3.	**Actuators**	**08**
	Actuators-principle, construction and specifications, Electromechanical: Relay, Solenoid, DC motor, AC motor, Stepper motor, piezo Electro thermal: Heaters Electro-optical: Displays (LED/LCD)	
4.	**Signal conditioning circuits**	**08**
	AC and DC signal conditional circuits Bridge Amplifier, Instrumentation amplifier, chopped and modulated amplifier Filters: passive and active Signal conditioning circuit for thermal and optical sensors, driver circuits for actuators Note: Design parameters should be considered	
5.	**Advanced technology for sensors**	**06**
	Performance testing of sensors-Impedance, Noise, Accuracy, reliability, environmental conditions Some examples from advance technology- SMD, Thin film/thick film, MEMs, Smart Sensors	
6.	**Case Studies**	**08**
	1. Automobile Applications 2. Industrial applications 3. Computer application Selection of sensors and actuators and their specifications	

Recommended Books:

1	D Patranabis	Sensors and Transducers , (2nd edition)2008	PHI
2	A. D. Shaligram	Sensors and Transducers	
3	R.Y. Borse	Sensors and Transducers, Principles and Applications	Adhyan Publishers & Distributers , New Delhi.
4	Kalsi	Electronic Instrumentation	
5	C. D. Johnson	Process control instrumentation technology	
6	Doeblin	Measurement systems	
7	B. G. Liptak	Process control Handbook	

Paper VI : Semester IV
OPTIONAL COURSES
EL 346-A Instrumentation

Learning Objectives :-

1. To understand working and characteristics of instrument or measuring system.
2. To understand designing and calibration problems in instrumentation system.
3. To understand various types of data acquisition systems.
4. To study some of the advanced measuring instruments.

1.	**General Instrumentation system**	**10**
	Generalized configuration and functional descriptions of measuring instruments: Functional Elements of an instrument , active and passive transducers , Analog and Digital Modes of Operation , Null and Deflection Methods , Input Output configuration of Instruments and measuring systems, Corrections and modifications in input signals	
2.	**Performance Characteristics of an Instrumentation system**	**08**
	Generalized measurements , zero-order System , First-order System , Second –order System , Dead-Time Element , Specifications and Testing of Dynamic Response .	
3.	**Manipulating , Computing and Compensating devices**	**10**
	Bridge circuits, Operational Amplifiers , Instrumentation Amplifiers , Transconductance and Transimpedance Amplifiers , Noise Problems , Shielding and Grounding , Electromagnetic Interference (EMI) , Charge Amplifiers and Impedance Converters , Integration , Differentiation	
4.	**Data Acquisition and Conversion**	**10**
	Generalized Data Acquisition system , Single channel Data Acquisition system , Multi channel Data Acquisition system , ADC, DAC, Multiplexers , Sample and Hold circuits , Data Transmission systems IEEE-488 GPIB	
5.	**Advanced measuring instruments**	**10**
	Absorption Wavemeters, Slotted line Measurements, Antenna system measurements , SWR meters , Spectrum analyzer , Lock in Amplifier , Digital Storage Oscilloscope. Calibration of frequency and time: National Institute of Standards and Technology Radio broadcast Time/Frequency services	

Recommended Books:

1	C S RANGAN , G R SARMA , V S MANI	Instrumentation Devices & Systems , 2nd Edition	Tata McGraw-Hill
2	Ernest O Doebelin , Dhanesh N Manik	MEASUREMENT SYSTEMS Application and Design , 5th Edition	Tata McGraw-Hill
3	Joseph J . Carr	Elements of Electronic Instrumentation and Measurement , 3rd Edition	Pearson Education

Paper VI : Semester IV

OPTIONAL COURSES

EL 346-B Consumer Electronics

Learning Objectives:

1. To understand working principles of various electronic gadgets and consumer products.
2. To identify the blocks in the consumer products and operations
3. To study the various technical specifications and facilities of the consumer products
4. To learn how to select the product by the way of comparing commercially available product.

1.	**Audio systems**	**08**
	PA system – Microphone, Amplifier, Loudspeakers Radio receivers – AM/FM Audio recording and reproduction – Cassettes, CD and MP3	
2.	**TV and Video systems**	**14**
	Television – standards, BW/Colour, CRT/HDTV Video system – VCR/VCD/DVD players, MP4 players ,Set Top box, CATV and Dish TV, LCD, Plasma & LED TV Projectors – DLP Home Theatres Remote Controls	
3.	**Landline and Mobile telephony**	**06**
	Basic landline equipment – CLI, Cordless Intercom/ EPABX system Mobile phones – GPRS & Bluetooth GPS Navigation system	
4.	**Office Equipments**	**08**
	Scanners – Barcode / Flat bed , Printers , Xerox , Multifunction units (Print, Scan, fax, copy)	
5.	**Electronic Gadgets and Domestic Appliances**	**12**
	Digital clock, Digital camera, Handicam, Home security system, CCTV Air conditioners, Refrigerators, Washing Machine/Dish Washer, Microwave oven, Vacuum cleaners	

Recommended Books:

1	R. P. Bali	Consumer Electronics	Pearson Education (2008)
2	R. G. Gupta	Audio and Video systems	Tata McGraw Hill (2004)

T.Y.B.Sc.(Electronic Science)
Practical courses

Aim and Objectives:

1. The practical activities are self learning process, there are three practical courses .
2. There are TWO activities i.e. one for Practical course-I and other for Practical course-II. One activity is equivalent to 4 experiments.
3. There will be no change in the workload in taking 16 experiments and one activity instead of 20 experiments.
4. There will be 16 experiments and one activity in each course. Student select the activity, throughout the year he/ she will work on it and at the end submit full activity report individually.
5. Student will prepare **a report on each activity**. It will be evaluated both at internal and university practical examination.
6. The progress of the student activity will access time to time/ weekly/ monthly by the teacher during regular practical timing.
7. This activity will generate good quality of work and prepare good report (study material with practical experience) which will be useful to the teachers, departments, other students etc.

In the practical course examination of 100 marks, 20% weightage will be given to activity done by the student at internal and external examination.

One activity is equivalent to 4 EXPERIMENTS performed by the student. (any one activity per course from the following)

a) Business entrepreneurship: Prepare plan for small scale industry with details about product, employee plan, available sources of raw material, field work, product cost , product sale plan etc.
b) Use of internet to prepare study material (Technical details) of advanced/ recent mission/ advanced research area. e.g. Mars mission, moon mission, organic LED, nano material –its application, new energy sources etc.
c) Documentation of ISO/ISI/IEEE standards used in different field such as important parameters for medical/ agri / food / milk/ petrol / diesel adulteration, air pollution , water pollution etc.
d) Documentation of advanced instruments used in various fields with all technical details. Seminar
e) Industrial visit/ Experience
f) System Simulation
g) Techno commercial study
h) Advanced Instrumentation study e.g. Spectrometer
i) Any other with permission of batch in-charge.

T.Y. B.Sc. (Electronic Science)

Paper VII EL-347 Practical Course- I

Note :

- There are 20 Experiments in Paper VII EL-347 Practical Course- I
- Student must perform minimum 14 experiments from group 1 to 4 (not less than 3 experiment from each group) and minimum 2 experiments from group 5.
- One activity as directed in practical course which will be equivalent to 4 experiments.
- For Internal Practical Examination (Out of 20) : 16 Marks to Experiments , 04 Marks to Activity
- For University Annual Practical Examination (Out of 80) :
  Two experiments of each of 3 hours duration.
  32 Marks for Experiment, 8 marks for oral exam.

[1] Analog Circuit Design and Application of Linear IC's

1. Design of differentiator circuit
2. Log amplifier (Using IC)
3. Design of inverting amplifier for given input impedance and bandwidth
4. Function generator using 8038/2206
5. Active filter circuits using MF-10 SC filter

[2] Power Electronics

1. SCR, MOSFET and IGBT characteristic
2. Light Dimmer circuit
3. Electronic Ballast
4. PWM based DC motor control
5. SMPS
6. Emergency light
7. Mains Over voltage Protector
8. Controlled rectifier
9. Study of UPS
10. AC and DC static switches
11. Analog/Digital Inverter

[3] Communication systems

1. FM modulator using VCO
2. FSK modulator and demodulator using XR 2206 and XR2212 repectively.
3. Four channel FDM
5. QASK/ BPSK using IC
6. SSB generation using IC 1596 and demodulation
7. Study of PLL
8. V-F and F-V convertor using IC 331

[4] Digital system design

1. Design 4 to 1 line MUX / 1 to 4 DEMUX using VHDL
2. Design 2 TO 4 DECODER using VHDL
3. Design 4 BIT BINARY ADDER / full adder using VHDL
4. Design J-K FF using VHDL
5 Rolling display
6 Stepper motor control sequence generator
7 Random number sequence generator.
8 Washing machine sequence control.

[5] Electronic Materials and Devices

1. Hall effect
2. Four probe method
3. Characteristic of solar cell
4. Energy band gap measurement
5. Reverse recovery time measurement of diode

T.Y. B.Sc. (Electronic Science)

Paper VIII EL-348 Practical Course- II

Note :

- There are 20 Experiments in Paper VII EL-348 Practical Course- II
- Student should perform minimum 8 experiments from group 1 and minimum 8 experiments from group 2 to 5 (maximum 4 experiments from any one group).
- Vocational students will perform minimum 8 experiments from group [1] & minimum 8 experiments from vocational laboratory.
- One activity as directed in practical course which will be equivalent to 4 experiments.
- For Internal Practical Examination (Out of 20) : 16 Marks to Experiments , 04 Marks to Activity
- For University Annual Practical Examination (Out of 80) :
  Two experiments of each of 3 hours duration.
  32 Marks to Experiment, 08 marls for oral.

[1] Microcontrollers and Embedded systems

1. Basic exercises on arithmetic, logical and data transfer operation
2. Programs on code conversion: dec-hex, hex-dec, ASCII – HEX, HEX – ASCII, BCD – seven segment
3. One Serial Communication
4. LCD interface
5. Interfacing of Keypad / Matrix KBD/TWS
6. Interfacing SSD / Stepper Motor/ LED Bank
7. ADC- Sensor ship LN35
8. DAC- tone Generator
9. Frequency Counter
10. Interfacing RTC with 8051
11. Traffic Light Controller/ Washing Machine Controller
12. Target Board Design.

[2] Sensor & Actuators

1. LVDT
2. Thermister Characteristic (B and TCR)
3. Angular displacement sensor using Hall Effect
4. Characteristic of phototransistor
5. Hot wire anemometer
6. Photodiode/LDR as photo sensor
7. Sound activated switch
8. Fluid level sensor

[3] Instrumentation

1. Precision rectifier circuit
2. Bootstrap ramp generator.
3. Regulated Circuit using IC 723(Low and High Voltage,1A Current)
4. Study of AM / FM transmitter
5. To study specification and applications of Lock in Amplifier / Spectrum Analyzer / Digital storage Oscilloscope

6. Circuit impedance measurement using Phase / frequency measurement.

[4] Consumer Electronics

1. Study of PA systems for various situations – Public gathering, closed theatre /Auditorium, Conference room, Prepare Bill of Material (Costing)
2. Installation of Audio /Video systems – site preparation, electrical requirements, cables and connectors
3. Market Survey of Products (at least one from each module)
4. Identification of block and tracing the system. Assembly and Disassembly of system using Toolkit

[5] Fiber Optics and fiber optic Communication

1. Study of propagation loss in optical fibers.
2. Study of bending loss in fibers.
3. Setting up of fiber optic voice link.
4. Measurement of Numerical Aperture.
5. Fiber terminations and polishing.
6. Fiber in sensor application.
7. Design of fiber optic Transmitter
8. Design of fiber optic Receiver.
9. Visit to telecom facility for observing Splicing, Alignment, Fusing, OTDR operation, Connectorization , Types of connectors, couplers and cables.

T.Y. B.Sc. (Electronic Science)
Paper IX EL-349 Practical Course- III
Project Work

Guideline to conduct Practical Course III

Practical Course III is a project work of 100 Marks.

There will be internal examination of 20 marks and external university examination of 80 marks for this course.

The project work should be followed with following guidelines:-

a) The name and subject of the project type must be well defined .
b) Planning of the work must be specified.
c) Theoretical , reference work must be provided.
d) Pilot experimentations / Preparations must be specified.
e) Typical design aspects , theoretical aspects , aim and objectives of the work must be specified in detail.
f) The actual work done must be reported along with experimentation procedures.
g) There must be observations , interpretations , conclusions , results of the project work.
h) Algorithm, program strategy, module wise description of parts etc be provided in case of projects related with development of computer software.
i) Applications, usefulness, students contribution in it must be clearly specified.
j) Further extension work may be suggested for better outcome of the project.
k) It is recommended to present the projects in competitions / project exhibitions organized by various authorities.