

SHIVAJI UNIVERSITY, KOLHAPUR.



***** B+
Accredited By NAAC

Revised Syllabus For
Bachelor of Science (Electronics)
(Part III)

(Subject to the modifications to be made from time to time)

Syllabus to be implemented from June 2008 onwards.

Shivaji University, Kolhapur
Revised Syllabus For
Bachelor of Science

1. TITLE : Subject Electronics
Optional/ under the Faculty of Science

2. YEAR OF IMPLEMENTATION:- Revised Syllabus will be implemented from June 2008 onwards.

4. GENERAL OBJECTIVES OF THE COURSE
applicable to the Degree

- 1) To intrudes the students about electronics word
- 2) Study of different components used in electronics
- 3) By using these components study of different electronic circuits and their applications in industry and day to day life industry and day to day life
- 4) Introductions of different circuits used in industry
- 5) To encourage the students to take electronics as a carrier which is the need now a days.
- 6) To make the pupils fit for the society

5. DURATION
• **The course shall be a full time course**

6. PATTERN:-
Pattern of Examination will be Annual

7. MEDIUM OF INSTRUCTION :
The medium of instruction shall be in English

8. STRUCTURE OF COURSE- -----

(Note – The structure & title of papers of the degree as a whole should be submitted at the time of submission/revision of first year syllabus.

FIRST YEAR ----- (NO.OF PAPERS--2-----)

Sr.No.	Subjects	Marks
1.	Basic Electronics Paper I	100
2.	Digital Electronics. Paper II	100
3.	Practical I	50
	Total	250

SECOND YEAR ----- (NO.OF PAPERS-2-----)

Sr.No.	Subjects	Marks
1.	Paper III	100
2.	Paper IV	100
3.	Practical	100
	Total	300

THIRD YEAR ----- (NO.OF PAPERS-4-----)

Sr.No.	Subjects	Marks
1.	Paper V	100
2.	Paper VI	100
3.	Paper VII	100
4.	Paper VIII	100
5.	Practical	200
	Total	600

9. SCHEME OF TEACHING

FIRST YEAR / SEMESTER – I/ II/----

Sr. No.	Subject /Paper	Teaching Scheme (Hrs/Week)			
		L	T	P	Total
1	Basic Electronics Paper I	2.5			} 5
2	Digital Electronics Paper II	2.5			
3	Practical			4	
	Total				

SECOND YEAR / SEMESTER – III/ ---- --

Scheme of Teaching and Examination

Sr. No.	Subject/Paper	Teaching Scheme (Hrs/Week)			
		L	T	P	Total
1	Paper III	3			6
2	Paper IV	3			
3	Practical I			4	
4	Practical II			4	
	Total				

THIRD YEAR / SEMESTER – V/ ---- --
Scheme of Teaching and Examination

Sr. No.	Subject/Paper	Teaching Scheme (Hrs/Week)			
		L	T	P	Total
1	Electronics Paper V	3			12
2	Electronics Paper VI	3			
3	Electronics PaperVII	3			
4	Electronics PaperVIII	3			
5	Practical I			5	
6	Practical II			5	
7	Practical III			5	
8	Practical IV			5	
	Total				

13. SCHEME OF EXAMINATION :-

- Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabi.

14. STANDARD OF PASSING:-

As Prescribed under rules & regulation for each degree/programme.

C] OTHER FEATURES :

1. INTAKE CAPACITY / NUMBER OF STUDENTS:-
As per university rules

2. TEACHERS QUALIFICATIONS:-

- As prescribed by norms .
- Work load for each teacher 20 lectures /week

3. Required Books, Journals and specific Equipments necessary for the Course.

(A) LIBRARY :

Reference and Text Books, Journals and Periodicals, Reference Books for
Advanced Books for Advanced studies.

(B) SPECIFIC EQUIPMENTS : Necessary to run the Course.

(T.V., V.C.R. V.C.P., L.C.D., Overhead Projector , Computers and necessary
softwares and operating systems etc.)

(C) LABORATORY SAFETY EQUIPMENTS :

B) GENERAL SAFETY RULES FOR LABORATORY WORK

1) List of equipments needed for Laboratory Safety:-

1. Fire extinguisher
2. First Aid Kit
3. Good earthing and insulated wirings for electrical supply.
4. Emergency exit
5. Apron and goggles wherever necessary
6. Fuming Chambers

Operational manuals for instruments (handling to be made as
suggested.)

13. Stabilized supply in the laboratory.

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4) DON'T

1. Don't work alone in the laboratory

2. Don't take apparatus out of lab.

3. Don't leave the laboratory without permission.



SHIVAJI UNIVERSITY, KOLHAPUR

Shivaji University, Kolhapur
B.Sc.(part-III) Electronics
(Implemented from June 2008)

Title of Theory papers

Ele(P-V): Linear Integrated circuit

Ele(P-VI): Communication Systems

Ele(P-VII): Microcontrollers and Embedded C

Ele(P-VIII): Instrumentation and Power Electronics

SHIVAJI UNIVERSITY, KOLHAPUR
B.Sc. (Part III) Electronics
Syllabus (June 2008)
ELE(P-V): Linear Integrated Circuit

(Section – I)

1. Fabrication of Linear ICs: [10]
Integrated-Circuit Technology,
Basic Monolithic Integrated Circuits,
Formation of monolithic Transistors, Diodes, Resistors and Capacitors.
LM 331 : V to F converter and F to V converter
LM 311 : Comparator IC
LM 301 : Op-Amp
2. DC and Differential Amplifiers: [8]
Transistor dc amplifier
Differential amplifier, Emitter coupled differential amplifier, Operations,
characteristics and parameters (Input Impedance, Output Impedance,
Common Mode and Differential Mode Gain, (CMRR),
AC and DC analysis for dual inputs and single ended output
FET differential amplifier, Constant Current Bias and Current Mirror Bias,
Cascaded differential amplifier stages
3. Operational Amplifier: [12]
Introduction to Op-Amp, Block diagram of typical Op-Amp,
Offset error voltages and currents, Offset balancing techniques,
Effect of temperature on offset voltages, currents and CMRR, Slew Rate,
Frequency response of Op-Amp.
Study of IC 741 and Comparative study of ICs 741, LM 308, LF 356
4. Op-Amp as Analog system Building Blocks: [12]
Inverting and Non-inverting amplifier, Summing amplifier (Adder and
Subtractor), voltage-to-current and current-to-voltage amplifier,
DC Voltage Follower, Differential dc amplifier, Bridge amplifier, Stable
ac-coupled and ac Voltage Follower, Differentiator and Integrator, Log and
Antilog amplifiers

(Section – II)

5. Active Filters: [8]
Advantages of active filters over passive filters, Study and Design of Low pass, High pass, Band pass, Band stop and all pass filters (up to 2nd order) Butter worth, Chebyshev filters (only low pass types), Elliptic filters
6. Non linear Analog Systems: [12]
Comparators, Sample and Hold circuit, Precision AC/DC converters, Waveform generators: Square wave generator, Pulse generator, Triangle wave generator, Regenerative Comparator (Schmitt Trigger), Sine-wave oscillators: Phase-Shift and Wein bridge oscillators, Precision Rectifier, Peak Detector, Clipping and Clamping circuits
7. Phase Locked-Loops (PLL): [12]
Theory of VCO, Loop filters, Block diagram of PLL, Calculation of Capture range, Lock range, Frequency Multiplication, FSK and FM-demodulation, Frequency Synthesizer, Use of IC DM 4046 and 565 Frequency Generator (Study of IC 8038)
- Applications of ICs:
Applications of 555 Timer: Variable Duty Cycle (10 % to 90 %), Sequential Timer, Ramp generator,
XR 2240 : Programmable counter
MC 1550 : Tuned amplifier
8. Power Supplies: [10]
Series and Shunt Regulators, Over Load and Over Voltage Protections., Voltage and Current Regulation, Regulators using ICs 78 XX, 79XX, 317, 723, Switch Mode Power Supply (SMPS), Comparison with conventional power supply, UPS

Reference Books:

- 1 Integrated Electronics - Millman-Halkias (MGH)
- 2 Op-Amps and Linear circuits - Ramakant Gaikwad (PHI)
- 3 Operational Amplifiers and Linear ICs - Caughlin and Driscoll (PHI)
- 4 Operational Amplifier with Linear Integrated Circuit – W. D. Stanley (CBS Publications)

- 5 Linear Integrated circuit - D Roy Choudhari, Shail Jain, (Wiley Eastern Ltd)
- 6 Micro electronics Circuits - Rashid (PWS publication)
- 7 Integrated circuit (New Edition) – K.R.Botkar
- 8 Linear ICs - Data Book
- 9 Op-Amp - G. B. Clayton, Butterworth Publication
- 10 Design with Operational Amplifiers and Analog ICs - Franco (Mc Graw Hill, 2000)

Ele(P-VI): Communication Systems
(Sections – I)

1. Fundamentals of Communication Systems [6]
 Introduction, Need and Importance of Communication,
 Generalized block diagram of communication system,
 Role of each block (information source, transmitter,
 channel/communication media, receiver)
 Concept of FDM and TDM,
 Types of communication systems- Simplex and Duplex systems,
 Analog and digital systems, Applications of Electronic Communications,
 Electromagnetic Spectrum used in communication and Various frequency
 bands, Concept of bandwidth,
 Noise in communication and types of noise (External and Internal) Noise
 voltage, Signal-to-noise ratio, Noise figure, Noise temperature

2. Modulation and Demodulation [14]
 Need and types of modulations,

 Analog Modulation:
 Amplitude Modulation, Principle, Mathematical Expressions, Modulation-
 Index and % modulation, Side bands and Frequency Spectrum, Power
 distribution, Single side band, Double side band and Vestigial side band
 concepts,

 Frequency Modulation:
 Principles, Side bands and Modulation index,
 Merits and Demerits of AM and FM Modulations, AM & FM transmitters

 Demodulation:
 Amplitude Demodulator (Diode detector),
 Frequency Demodulator, Foster-seely Detector and Ratio Detector

 Digital Modulation:
 Concepts of ASK, FSK, PCM and PWM,
 Numerical Problems

3. Antenna and Radio wave Propagation [6]
 Antenna, Parameters, Types of antenna – Half Wave Dipole, Yagi antenna,
 Dish antenna, Applications,
 Radio wave propagation, Ground wave, Sky wave, Space wave,
 Ionosphere, Important features, Effects of ionosphere on radio waves,

Line of sight communication, Concept of skip-distance

4. Radio Receivers and Television: [14]
AM Superheterodyne Receiver: block diagram and explanation of each block, Selection of Intermediate Frequency, Receiver characteristics,
FM Receiver: Block diagram and explanation
Television: Picture formation, picture tube, scanning (horizontal and vertical) and scanning frequency, Balancing and Synchronization, Picture qualities (Brightness, contrast, Aspect ratio, Viewing distance colour level and Hue)
TV Broadcasting system:
TV transmission, Synchronization and interlacing scanning, Composite video signal, channel bandwidth, Vestigial side band transmission, Monochrome and colour TV receiver, Block diagram and explanation of each block, Colour Picture Tube (Trinitron)

(Section - II)

5. Telephone Communication System: [12]
Principle, Telephone hand-set, subscriber, local loop
Need of Exchange, Electronic Exchange, Different tones in telephone, Pulse and DTMF dialing, EPABX, concepts of various value added services (Call transfer, Call queuing, Conference call, Priority calls)
6. Modern Communication Systems: [12]
FAX, Radio-Paging, Mobile Communication and Block Schematics, Cellular phones, Picture phone, Video conferencing, Concept of ISDN
Optical Fiber Communication (part 1)
Block diagram of Optical Fiber Communication, Source and Detector, Fiber Optic Cables,
7. Optical fiber communication: (part 2) [10]
Transmitter, Receivers, Splices and Connectors, Fiber Optic Data Communication
Satellite Communication
Satellite Orbits, Satellite Communication System, Earth Station and Transponders, Applications- Surveillance, Navigation, TV distribution and Satellite Telephones
8. Computer Communication: [10]
Digital (Data) Communication Concepts, Digital Communication System (Block Diagram), Modem and Types of Modem (ASK, FSK, and PSK), Computer Networks, Network Topologies, Classification of Networks, LAN, WAN, Concept of Internet, Application of e-Mail and e- Business

Services, Cable Services, TV Signal,
Internet, e-Communication

Reference Books

- 1 Electronic communication - Roddy and Collin, PHI
- 2 Communication Electronics - Frenzel (MGH)
- 3 Principles of communication-(New Edition) - Anokh-Singh
- 4 Electronics and Communication Engineering - Gupta and Soni
- 5 Communication - Sanjeev Gupta
- 6 Analog and Digital Communication Systems - Martin S. Roden, 5th Edition (SPD Publication)
- 7 Digital and Data Communication - Martin (PHI)
- 8 Hand Book of Electronic Communications - Millar
- 9 Monochrome and Colour TV - Gulati (John Willing)
- 10 Television - Dhake (TMH)
- 11 Antenna and Wave Propagation - K. D. Prasad
- 12 Optical Fiber – Geigal
- 13 Mobile Communication – Schiller
- 14 Communication Systems – NIIT, PHI

Ele(P-VII): Microcontrollers and Embedded C

(Section - I)
Microcontroller

- 1 Introduction: [10]
Requirement of Microcontrollers, Comparison of Microprocessor and Microcontroller, Feature of modern microcontrollers: WDT (COP), Brown out detector, ISP, I²C bus, SPI bus, Analog I/O Port, PWM, Low voltage devices. Survey of 4-Bit, 8-Bit, 16-Bit And 32-Bit Microcontrollers and their application areas, Various 8-Bit Microprocessor and their Comparison, Study of 8051 and its Family (89C51, DS5000, 8031, 8032, 8052, 8751, Phillips RD2, 89C51VRD2)

Architecture of 8051:

Block Diagram of 8051 and Study of Internal Blocks, Reset and Clock, Registers, Flags and Internal Memory, SFR, I/O Ports.
2. 8051 Instruction Set: [10]
Study of 8051 Instruction Set and Addressing Modes, Moving the Data (Internal and External), Arithmetic Instructions, Logical Operations, JUMP, Loops and CALL Instructions, Single Bit Instructions, Stack and Interrupts, Programs of 8051 based on above instructions, Instruction Execution Cycle
3. Facilities in 8051 [10]

Timer and Counter: Timer and Counters, Timer modes, Timer Counter registers, Programming the timers in various modes. Time delay generation.

Serial Port : Serial port of 8051, RS-232 standard and IC MAX-232, Band rate in 8051, SBUF, scan registers, various modes of serial port, programming in mode-1, Importance of TI and RI flags, Band rate and Baud rate doubling.
 Interrupts : Sources of interrupts, enabling and disabling the interrupts, IE, TCON registers, interrupt priority, IP register. Programming external interrupts, Level and edge triggering.

4. Interfacing Methods and Applications: [10]
 I/O Port Programming, Demultiplexing AD0-AD7, memory interface and expansion, I/O Interface and expansion, Interfacing LED and LCD (Alpha Numeric), Switch, Relay and Opto-coupler, Stepper Motor Control, Speed Control of DC motor by PWM technique.
 DAC/ADC Techniques and Interface:
 [10]
 DAC R-2R ladder, ADC, Dual Slope, Successive Approximation Technique, Study of DAC 0800/1408 and ADC 0809/0801 Chips (specifications expected), Interfacing D/A Converter and A/D Converter,

Reference Books

(Section – I)

- 1 The 8051 Microcontroller -K. J. Ayala, (Penram International)
- 2 Microcontroller- John Stewart, Psicataway, New Jersey, (PHI)
- 3 The 8051 Microcontroller and Embedded Systems, M. A. Mazadi, J. G. Mazadi, Pearson Education, Asia
- 4 Programming and customizing the 8051 Microcontroller - MYKE Predko (TMH, New Delhi)
- 5 Microprocessor and Microcontroller Hand Book - (BPB Publication)

Section II Embedded C

5. Revision 'C' Programming for MCS – 51 (part 1)
Relational operators, if else statement, if else chain, the switch statements, while statement, for statement, do statement.
Writing user-defined functions, standard library functions.
6. Revision 'C' Programming for MCS – 51 (part 2)
Arrays and pointers, Array definition, initialization, two-dimensional arrays, pointers, passing and using array addresses, pointer arithmetic.
7. Importance of C for microcontroller: (part I – basics)
The C – preprocessor, language extensions and C data types for 8051 (MCS-51).
8. Importance of C for microcontroller: Part II – programming 'C'
Time delay in C.
I/O programming in 8051 C.
Accessing SFR addresses.
Logic operation in 8051 C.

**Data conversion programs in 8051 C.
Accessing code ROM space in 8051 C.
Programming timer/counter, interrupts, serial I/O etc in C for
8051.**

References:

1. The C Programming Language, Second Edition, Kernighan & Ritchie, Prentice-Hall Inc.
2. C: A Reference Manual, Second Edition, Harbison & Steel, Prentice-Hall Software Series
3. C and the 8051: Programming and Multitasking, Schultz, P T R Prentice-Hall, Inc.
4. The 8051 Microcontroller and Embedded Systems, M. A. Mazadi, J. G. Mazadi, Pearson Education, Asia
5. Embedded C, Michael J. Pont,

Ele(P-VIII)Instrumentation and power Electronics
(Section –I)

- 1 Introduction: [12]
Performance Characteristics, Static characteristics, Errors in measurement, Types of errors, Sources of errors, Dynamic Characteristics and Response, Standard and International standards

Transducers:

Selection factors, Electrical Transducers and their parameters; Types of Transducers, Electro-acoustic transducer: Microphone: Carbon, Piezoelectric, Moving Coil, Loud Speakers: PMMC Loud Speaker, Force/Pressure transducer: Strain-Gauges, Potentiometer, Piezo-Electric Transducer, Linear Variable Differential Transducer (LVDT), Capacitive Transducer; Load cell; Photoconductive cells, Photo-voltaic Cell; Digital Displacement Transducer,

2. Signal Conditioning: [8]
Introduction, Instrumentation Amplifier, Characteristic study of IC LM 725, Strain Gauge, Bridge amplifier, Thermocouple Amplifier, Study of IC AD 594, AD595, Thermister Amplifier (IC 5420), Design of Data Acquisition System for measurements of temperature, pH and Level, Grounding, Shielding and Isolation Techniques

- 3 Display devices and systems: [8]
LED, LCD, Display Technique using LED and LCD, CRT Display

Recorders:

XY and XT Recorders, Oscillo-graphic Recorders, Digital, Magnetic Tape-Recorders

4. Temperature Transducer: RTD, Thermocouple; IC LM 34/35, AD 590 [10] Thermister

Instruments:

Digital Voltmeter and Multimeters, Digital Tachometer, pH meter,

Electrocardiograph (ECG), Oscilloscope.

(Section-II)
Power Electronics

5. Power diodes :

Construction of the diode (drift layer), conductivity modulation, I-V characteristics, Reverse recovery effect (analysis), types of diode, Spice diode model, series and parallel connections of diode (diodes with RC, RL, LC and RLC loads (analysis expected).

Power transistors:

structure, operation, effect of drift layer. Switching characteristics, specifications. Base drive circuits.

Power MOSFET: MOSFET, structure of MOSFET, characteristics, operation and drive circuits.

IGBT: structure, characteristics, operation and drive circuits comparison of power transistor, MOSFET and IGBT

6. Thyristors :

structure, I-V characteristics, two transistor analogy, Turn on and turn off processes. Thyristor rating, concept of di/dt and dv/dt , Triac, different modes of operation, ratings, MOS controlled Thyristors.

7. Uncontrolled rectifiers:

Basic & three phase supply, phase and line voltage waveforms, three phase half wave rectifier with R and L load, analysis with resistive load, three phase full wave rectifier with resistive and large inductive load, three phase bridge rectifier with resistive and inductive load, analysis with resistive load. Comparison of HWR, FWR and FWBR.

Controlled rectifier :

Concept of firing angle, synchronization, HF converter with R, L load. Use of freewheeling diode, semiconverter with R, L load. Studies on these circuits with RLE load. Full converter with R and large inductive load. (Analysis of all these circuits with inductive and resistive load.)

8. Single phase AC voltage controllers:

Principle of ON-OFF control, single-phase bidirectional controller with resistive and inductive load. (Analysis of these circuits.)

Applications of Power Electronics :

SMPS, UPS, Electronic Ballast, power factor correction. Principle of induction and dielectric heating.

Reference Books

(Section – I)

1 Electronic Instruments – K.S.Kalsi, (Tata Mc-Graw Hill)

2 Instrumentation, Measurements and Analysis -B.S. Nakara and VSV Mani (TMH)

- 3 Instruments and Instrumentation Technology – M.M.S. Anand (PHI)
- 4 Instrumentation and Measurements -Moorthy, (Prentice Hall India)
- 5 Instrumentation, Devices and System -C.S. Rangan, G.R. Sharma and VSV Mani (TMH)
- 6 A course in Electrical and Electronic Measurements and Instrumentation. A .K. Sawheney (Dhanpat Rai and Sons)
- 7 Transducers and Display systems -B.S. Sonde

(Section – II)

1. Power Electronics - M. H. Rashid (PHI)
2. Power Electronics – Jamil Asghar (PHI)
3. Power Electronics -.P.C. Sen
4. Power Electronics -Samir K. Datta (PHI)
5. Thyristor Engineering – M.S.Berde, Khanna Publications
6. Power Electronics Principles and Applications - S. Biswas (Dhanapat Rai Publication)
7. Electronics In Industry - G. M. Chute and R.D. Chute, (Mc Graw Hill)
8. Linear Integrated circuit - D Roy Choudhari, Shail Jain, (New Age International Pvt Ltd.)
9. Medical Electronics –Khandpur
10. Power Electronics – by Katave.
11. Power Electronics – by Jalnekar. Technical Publication Pune.
12. Power Electronics – by Bhimara.

B.Sc. (Part III) Electronics Practical Course

(List of Experiments)

[minimum 32 experiments have to be performed by a student out of 40 experiments prescribed]

Group-A

1. Study of Operational Amplifier Parameters
2. Study of Operational Amplifier as an Adder and Subtractor circuit
3. Study of Operational Amplifier as an Integrator and Differentiator
4. Study of Operational Amplifier as Voltmeter and Ammeter
5. Study of Operational Amplifier as Band Pass and Band Stop Filter
6. Wein-Bridge Oscillator by using Operational Amplifier
7. Study of Schmitt Trigger Using Operational Amplifier
8. Study of PLL (IC 565) characteristics and its application Frequency Multiplier
9. Study of Function Generator using IC 8038
10. Frequency-to-Voltage converter and Voltage-to-Frequency converter (IC LM 331)

[Minimum of 8 experiments have to be performed by student]

Group (B)

1. Study of Amplitude Modulation-Demodulation
2. Study of Frequency Modulation-Demodulation
3. Study of FSK Modulator and Demodulator

4. Design of tuned RF amplifier
5. Voice link using optical fiber cable
6. Study of Mixer stage in Super heterodyne receiver
7. Study of Pulse width Modulation
8. Study of Composite Video signal
9. Internet-I
10. Internet-II

[Minimum of 8 experiments have to be performed by student]

Group-C

1. Interfacing of Thumb wheel switch, 7-segment LED and Relay to 8051
2. Study of I/O programming of 8051
3. Interrupt programming of 8051
4. Study of 8051 timers
5. Interfacing of DAC and ADC to 8051
DAC: Square and Ramp generation
ADC 0809/0804: 0-5V,
6. Arithmetic operation with μ C 8051-C
7. Study of addressing modes of μ C 8051-C
8. Logical and Bit Processing with μ C 8051-C
9. I/O Programming with μ C 8051: Square wave generator, LED ON/OFF
10. Timer and Counter Technique using μ C 8051-C: Stepper/ac/dc motor control

[Minimum of 8 experiments have to be performed by student]

Group(D)

1. Study of thermocouple (594/595)
2. SCR Firing by UJT
3. Study of Linear Regulator IC 723 (Fixed and Variable)
4. Study of SMPS (IC 3524 / TL 494)
5. Study of AC/DC Timer.
6. Study of Instrumentation Amplifier (TL084)
7. Measurement of Strain Gauge- using Bridge Amplifier.
8. Study of LVDT or Phase-Shift Control
9. Study of ON/OFF Temperature Controller (LM 34/AD590)
10. DC Motor Control.

[Minimum of 8 experiments have to be performed by student]

Project

Every student should take up a project & submit in the report the work he has carried out. The project work will be assessed independently at the time of practical examination.

Industrial Visits

In order to give exposure of Industry, Research Institute & advances in the field of electronics industrial visits should be arranged. It is expected that students of B.Sc. I, II, & III should visit the Electronics Industries / Research Institutes / Educational Institutes.

Seminars

Every students of B.Sc. II & B.Sc. III Electronics will have to deliver one seminar of at least 15 min. on the advanced topics in the Electronics, which are not included in the syllabus. The seminar will be the compulsory activity for all the students of B.Sc. II & B.Sc. III electronics