Faculty of Science and Technology

North Maharashtra University, Jalgaon

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

Syllabus

For

F. Y. B.Sc. (Electronics)

(*As per Choice Based Credit System*)

(With effect from June - 2018)

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, 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, 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, one day workshop was organized for syllabus framing. Participants in the workshop cooperated with their constructive minds of re-structuring the syllabi of F.Y.B.Sc. (Electronics) as per the CBCS pattern and it has been finalized during the workshop and the same will be effectively implemented from the academic year 2018-19. The main objective of reforming the syllabi of F.Y.B.Sc. (Electronics) is to create man power that can cater the present needs of the society with perfect understanding of Electronics and complete skill to serve the industry and country. It is expected that the students studying Electronics will apply their practical minds to solve real life problems of the society and the world in future by becoming entrepreneur to serve the mankind.

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

Objectives:

1. To prepare students as a successful person in a life which cater needs of the society and serve country.
2. To prepare the students for successful career in industry and motivate them for higher education.
3. To provide strong platform for analyzing electrical and electronics problems.
4. To provide knowledge on basic electronics to Digital electronics and Integrated circuit chips and their applications for the society.
5. To provide necessary foundation on computational platforms and software simulation tools.
6. To develop observational skills, confidence in using electronics equipment and relate the knowledge of practical concepts for the development of the society.
7. To provide comprehensive knowledge and understanding in the relevant fields and enable students to pursue the Electronics subject at an advanced level later and to attract outstanding students from all backgrounds.

North Maharashtra University, Jalgaon

Class: **F. Y. B. Sc.**

Subject: **Electronics**

Choice Base Credit System (With effect from June 2018)

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 in workshop for F.Y.B.Sc. Syllabi revision. The titles of the papers for F.Y.B.Sc. (Electronics) are as given below:

Semester	Course as per UGC Guidelines	Core Course		No. of Credits	Clock Hour/ Semester	Marks	
		Course Code	Course Title			Int.	Ext.
I	**Electronics-DSC 1A:** Network Analysis and Digital Integrated Circuits (Credits: Theory-04, Practicals-02) ELECTRONICS LAB	ELE-101	Network Analysis and Semiconductor Diodes	2	30	40	60
		ELE-102	Digital Integrated Circuits	2	30	40	60
		ELE-103	ELECTRONICS LAB -I	2	60	40	60
II	**Electronics-DSC 1B:** Analog Electronics and Linear Integrated Circuits (Credits: Theory-04, Practicals-02) ELECTRONICS LAB	Course Code	Course Title	No. of Credits	Clock Hour/ Semester	Marks	
						Int.	Int.
		ELE-201	Analog Electronics	2	30	40	60
		ELE-202	Linear Integrated Circuits	2	30	40	60
		ELE-203	ELECTRONICS LAB -II	2	60	40	60

North Maharashtra University, Jalgaon

Syllabus of F. Y. B. Sc. Electronics

(Choice Based Credit System)

Semester I

ELECTRONICS-DSC 1 A: NETWORK ANALYSIS and DIGITAL INTEGRATED CIRCUITS

Theory: 60 clock hours

(Credits: Theory-04, Practicals-02)

Course description:

This course is aimed at introducing the fundamentals of Electronics, Network Theorems Electronic Devices to Under Graduate students and provide them practical exposure.

Course objectives:

1. To impart knowledge of basic concepts in Electronics.
2. To provide the knowledge and methodology necessary for building electronics circuits.
3. To provide exposure of linear and digital electronics circuits.
4. To have practical exposure of electronic circuits.
5. To predict the behaviour and characteristics of electronics devices and circuits using simulation tools.

Course outcome:

Learner will be able to ….

1. Apply knowledge to develop circuits using electronic devices.
2. Apply the concept and knowledge of electronics devices to real life problems.
3. Simulate complex circuits and understand the behaviour of the systems.
4. Understand and analyse, linear and digital electronic circuits.
5. Review, prepare and present technological developments.

F.Y.B.Sc. (Electronics) Sem-I Paper-I (Credit:02)

ELE-101: Network Analysis and Semiconductor Diodes (30 clock hour)

Course Content

Unit 1: Basic Circuit Concepts

Resistive circuits: Series circuit, characteristics of series circuit, series voltage divider, open and short in series circuit, Parallel circuit, laws of parallel circuit, open and short in parallel circuit, series-parallel circuits

Inductors: Self and mutual inductance, Inductance in series and parallel

Capacitors: Principles of capacitance, capacitors in series and parallel

(5 hour, 12 Marks)

Unit 2: Circuit Analysis

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star and Delta networks, Star-Delta Conversion. Problems based on KCL, KVL and Star-Delta conversion.

(6 hour, 12 Marks)

Unit 3: Network Theorems

Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Problems based on these theorems.

(8 hour, 14 Marks)

Unit 4: Junction Diode

PN junction diode –formation/construction, Formation of Depletion Layer, forward and reverse biasing, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode- I-V characteristics, Zener and avalanche breakdown, Reverse saturation current.

(5 hour, 10 Marks)

Unit 5 Applications of Junction diodes

Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, PIV, ripple factor and efficiency (Derivation not expected). Comparison of rectifiers, Filter-Shunt capacitor filter, its role in power supply, output waveform, and working.

Zener diode as voltage regulator, Problems on Zener regulator.

(6 hour, 12 Marks)

Reference Books:

- Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)
- Electrical Circuits, K.A. Smith and R.E. Alley (2014) Cambridge University Press
- Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
- Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.

F.Y.B.Sc.(Electronics) Sem-I Paper-II (Credit:02)

ELE-102: Digital Integrated Circuits (30 clock hour)

Course Content

Unit 1: Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code (8421), Gray code, Binary addition, Subtraction by 1's and2's complement method. Octal and hexadecimal addition and subtraction **(9 hour, 18 Marks)**

Unit 2: Logic Gates and Boolean algebra: Logic symbol and Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, NAND and NOR as universal Gates, Basic postulates and fundamental theorems of Boolean algebra

(4 hour, 8 Marks)

Unit 3: Combinational Logic Analysis and Design: Standard representation of logic functions (SOP & POS), Min and max terms, Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP).
Arithmetic Circuits: Binary Addition. Half and Full Adder
Data processing circuits: Multiplexers (2:1 and 4:1), De-multiplexers (1:2 and 1:4), Decoders (BCD to Decimal Decoder), Encoders (Decimal to BCD Encoder).

(8 hour, 16 Marks)

Unit 4: Sequential Circuits: S-R, D, J-K and T Flip flop, Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in J-K Flip-Flop. Master-slave J-K Flip-Flop.
Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only 4 bits).
Counters (4 bits): Asynchronous counters, Decade Counter. Synchronous Counter.

(9 hour, 18 Marks)

Reference Books:

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- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011), Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, (2009) PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, (2011) Tata McGraw Hill.
- Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

F.Y.B.Sc.(Electronics) Sem-I Paper-III (Credit:02)

ELECTRONICS LAB: DSC 1A LAB: Network Analysis and Digital Integrated Circuits Lab (60 clock hour)

ELE-103: ELECTRONICS LAB-I

(**First experiment is compulsory,** and students should perform at least **four** experiments from each section means **total nine** experiments)

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), digital Multimeter, Function Generator and Oscilloscope.

Section A: Network Analysis and Semiconductor diode

2. Measurement of Amplitude, Frequency and Phase difference using Oscilloscope.
3. Verification of (a) Thevenin's theorem and (b) Norton's theorem.
4. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem.
5. Verification of the Maximum Power Transfer Theorem.
6. Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
7. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR).
8. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.

Section B: Digital Integrated Circuits

1. Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICS
2. To design a combinational logic system for a specified Truth Table. (b) To convert Boolean expression into logic circuit and design it using logic gate ICs. (c) To minimize a given logic circuit.
3. Study of Half Adder and Full Adder.
4. Study of Half Subtractor and Full Subtractor.
5. Study of BCD to seven-segment decoder.
6. To build and test Flip-Flop (Clocked RS, D-type) circuits using NAND gates.
7. To build and test JK Master-slave flip-flop using Flip-Flop ICs
8. To build and test Counter using D-type/JK Flip-Flop ICs and study timing diagram.
9. To build and test Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.
10. To study decade counter using IC 7490.

Reference Books:

• Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)

• Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.

• J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)

• Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation.

- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011) Tata McGraw

- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

- Digital Electronics, S.K. Mandal (2010) 1st edition, McGraw Hill

Semester II

ELECTRONICS-DSC 1 B: ANALOG ELECTRONICS and LINEAR INTEGRATED CIRCUITS

Theory: 60 clock hours

(Credits: Theory-04, Practicals-02)

Course description:

This course is aimed at introducing the concepts of integrated circuits including linear and digital chips to Under Graduate students and provide hands on training of handling integrated circuit chips.

Course objectives:

1. To impart knowledge of electronics devices and integrated circuits.
2. To provide the knowledge and methodology necessary for using integrated circuit chips.
3. To have practical exposure of handling Electronics devices and IC chips.

Course outcome:

Learner will be able to ….

1. Apply the concept and knowledge of integrated circuit chips to develop new systems.
2. Apply practical knowledge to solve real life problems of the society.
3. Understand of the course and create scientific temperament and give exposure to the students for independent use of integrated circuit chips for innovative applications.
4. Model complex circuits and simulate them.
5. Handle simulation software to analyse electronics circuits.

F.Y.B.Sc.(Electronics) Sem-II Paper-I (Credit:02)

ELE-201: Analog Electronics (30 clock hour)

Course Content

Unit 1: Bipolar Junction Transistor

Construction and operation of BJT (NPN and PNP), CB, CE and CC configuration, characteristics of transistor in CE and CB configurations, h parameter definitions for CE, Regions of operation (active, cut off and saturation), Current gains α and β. Relations between α and β. dc load line and Q point. **(6 hour, 12 Marks)**

Unit 2: Amplifiers

Transistor as an amplifier, Need of biasing, Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor (Derivation not expected). Classification of amplifiers, single and two stage RC Coupled Amplifier and its Frequency Response. **(10 hour, 20 Marks)**

Unit 3: Feedback and oscillators

Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only). Tank circuit, Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator-circuit diagram and working.

(8 hour, 16 Marks)

Unit 4: Unipolar Devices

JFET. Construction, working and I-V characteristics (output and transfer), Pinch off voltage. Concept of MOSFET, UJT, basic construction, working, equivalent circuit and I-V characteristics. **(6 hour, 12 Marks)**

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, (2014), 6th Edn., Oxford University Press.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
- J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)
- Basic Electronics, Bernod Grob, McGra-Hill, India.
- Applied Electronics, R. S. Sedha; S. Chand and Company, New Delhi.

F.Y.B.Sc.(Electronics) Sem-II Paper-II (Credit:02)

ELE-202: Linear Integrated Circuits (30 clock hour)

Course Content

Unit 1: Operational Amplifiers

Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate.

(6 hour, 12 Marks)

Unit 2: Applications of Op-Amps:

Inverting and non-inverting amplifiers, concept of Virtual Ground, Summing and Difference Amplifier, Differentiator, Integrator, Wein bridge oscillator, Comparator and Zero-crossing detector, and Active low pass and high pass Butterworth filter (1st order only), Problems based on applications.

(12 hour, 24 Marks)

Unit 3: Clock and Timer (IC 555)

Introduction, Block diagram of IC 555, Astable, Monostable and Bistable multivibrator circuits. Period and frequency of multivibrators, Problems.

(4 hour, 8 Marks)

Unit 4: D-A and A-D Conversion

4-bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution. A-D conversion characteristics, Types of ADC (list only), Successive approximation ADC. Problems on DAC. **(8 hour, 16 Marks)**

Reference Books:

- OP-Amps and Linear Integrated Circuit, R. A. Gaikwad, 4th edition (2000), Prentice Hall
- Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, (2011), Oxford University Press.
- Digital Systems: Principles and Applications, R.J.Tocci, N.S.Widmer, (2001) PHI Learning.

F.Y.B.Sc.(Electronics) Sem-II Paper-III (Credit:02)

ELECTRONICS LAB- DSC 1B LAB: Analog Electronics and Linear Integrated Circuits Lab

ELE-203: ELECTRONICS LAB-2 (60 clock hour)

At least **04 experiments each** from **section A, B and C**

Section-A: Analog Electronics (Circuits)

1. Study of the I-V Characteristics of BJT in CB and CE configuration.
2. Study of the I-V Characteristics of UJT and design relaxation oscillator.
3. Study of the output and transfer I-V characteristics of common source JFET.
4. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
5. Study of a Single Stage CE amplifier.
6. Study of the RC Phase Shift Oscillator.
7. Study the Colpitts's oscillator.

Section-B: Op-Amp. Circuits

1. To design an inverting amplifier using Op-amp (741/351) for dc voltage of given gain
2. (a) To design inverting amplifier using Op-amp (741/351) and study its frequency response (b) To design non-inverting amplifier using Op-amp (741/351) & study frequency response
3. To add two dc voltages using Op-amp in inverting and non-inverting mode
4. To design a precision Differential amplifier of given I/O specification using Op-amp.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To design a Wien bridge oscillator for given frequency using an op-amp.
8. To design a circuit to simulate the solution of simultaneous equation and 1st/2ndorder differential equation.
9. Design a Butterworth Low Pass active Filter (1st order) and study Frequency Response
10. Design a Butterworth High Pass active Filter (1st order) and study Frequency Response
11. Design a digital to analog converter (DAC) of given specifications.
12. To design an Astable Multivibrator of given specification using IC 555 Timer.
13. To design a Monostable Multivibrator of given specification using IC 555 Timer.

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices

1. Characteristics of junction diode
2. Characteristics of BJT
3. Characteristics of JFET/MOSFET.
4. To verify the Thevenin and Norton Theorems.
5. Design and analyse the series and parallel LCR circuits
6. Design the inverting and non-inverting amplifier using an Op-Amp of given gain
7. Design and Verification of op-amp as integrator and differentiator
8. Design the 1st order active low pass and high pass filters of given cut-off frequency
9. Design a Wein`s Bridge oscillator of given frequency.
10. Design clocked SR and JK Flip-Flop`s using NAND Gates
11. Design 4-bit asynchronous counter using Flip-Flop ICs
12. Design the CE amplifier of a given gain and its frequency response.

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, (2014), 6th Edn., Oxford University Press.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011) Tata McGraw
- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn., (2000) Prentice Hall
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)
- Digital Electronics, S.K. Mandal (2010) 1st edition, McGraw Hill

Equivalent Courses with Credits

Semester	Core Course		No of Credits	Clock Hours/ Semester	Marks		Old Syllabus Code
	Course Code	Course Title			Int.	Ext.	
I	ELE-101	Network Analysis and Semiconductor Diodes	2	30	40	60	ELE 111: Analog Electronics – I
	ELE-102	Digital Integrated Circuits	2	30	40	60	ELE – 112 - Digital Electronics – I
	ELE-103	ELECTRONICS LAB -I	2	60	40	60	ELE-113: Practical Course
II	Course Code	Course Title	No of Credits	Clock Hours/ Semester	Marks		Old Syllabus Code
					Int.	Int.	
	ELE-201	Analog Electronics	2	30	40	60	ELE 121: Analog Electronics – II
	ELE-202	Linear Integrated Circuits	2	30	40	60	ELE – 122 - Digital Electronics – II
	ELE-203	ELECTRONICS LAB -II	2	60	40	60	ELE-123: Practical Course