Faculty of Science and Technology

KBC 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 July - 2022)

Preamble

The University Grants Commission (UGC) has initiated several measures to bring distinction, quality and uniformity in the Higher Education System of the country. The important measures taken to enhance academic standards include enhancements in curriculum, teaching-learning process and examination and evaluation systems. In view of this, KBC North Maharashtra University, Jalgaon has taken several initiatives to upgrade and improve the academic excellence, examination reforms for overall development of the students. As per the expectations of UGC, KBC North Maharashtra University, Jalgaon is going to implement the Choice Based Credit (CBCS) pattern to undergraduate program. As per the initiatives led by the Honorable Vice Chancellor, Pro-Vice Chancellor and Dean of the Faculty of Science and Technology and academic bodies of our university, 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 2022-23. 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),
KBC 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.

KBC North Maharashtra University, Jalgaon

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

Subject: **Electronics**

Choice Base Credit System (With effect from July 2022)

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 Basics of Digital Electronics (Credits: Theory-04, Practicals-02) ELECTRONICS LAB	ELE-101	Circuit Components and Network Analysis	2	30	40	60
		ELE-102	Basics of Digital Electronics	2	30	40	60
		ELE-103	ELECTRONICS LAB -I	2	60	40	60
II	**Electronics-DSC 1B:** Analog Electronics and Digital 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	Digital Circuits	2	30	40	60
		ELE-203	ELECTRONICS LAB -II	2	60	40	60

KBC North Maharashtra University, Jalgaon

Syllabus of F. Y. B. Sc. Electronics

(Choice Based Credit System)

Semester I

ELECTRONICS-DSC 1 A: Network Analysis and Basics of Digital Electronics

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: Circuit Components and Network Analysis (30 clock hour)

Course Content

Unit 1: Basic Circuit Components

Resistors: Introduction of resistor, 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

Transformers –Step-up and Step-down Transformers, Turn-Ratio, Voltage and Current Ratio. Types of Transformer (introduction only)

Relays and Switches- Electromagnetic Relay, Relay as Switch, Concept of Pole and Throw, Types of Switches – SPST, SPDT, DPST and DPDT. **(8 hour, 16 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 Problem on Star-Delta conversion. **(7 hour, 14 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. **(7 Hour 14 Marks)**

Unit 4: AC Fundamentals

Types of Alternating Waveforms, Basic AC Generator, Definitions of Cycle, Time Period, Frequency and Amplitude, Characteristics of a Sine Wave, Audio and Radio Frequencies, Different Values of Sinusoidal Voltage and Current, Phase of an AC ,Phase Difference, Vector Representation of an Alternating Quantity, AC through pure resistance , inductance and capacitance. Concept of Reactance and Impedance, RL, RC and RLC circuits, Passive RC filters (Low pass, high pass and band pass filters). Series and parallel resonance **(8 hour, 16 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.
- Alternating Current Fundamentals, Stephen Herman et.al.

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

ELE-102: Basics of Digital Electronics (30 clock hour)

Course Content

Unit 1: Number System and Codes: Introduction, Concept of Radix, Number Systems: Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Base conversion
Codes: BCD Code, Excess-3 Code, ASCII code. **(8 hour, 16 Marks)**

Unit 2: Logic Gates: Concept of Positive and Negative Logic, Basic Gates (Symbol and Truth table): OR Gate, AND Gate, NOT Gate, Derived Gates: NAND gate, NOR Gates, EX-OR Gate, EX-NOR Gate, NAND and NOR as Universal Logic Gates
Applications of XOR gate: Controlled inverter, Parity Tester **(6 hour, 12 Marks)**

Unit 3: Binary Arithmetic and Boolean algebra
Binary Arithmetic: Addition and Subtraction, 1's Complement, 2's Complement of binary number, Binary Subtraction**:** Using 1's Compliment & 2's Complement, Half adder and Full Adder, Basic Laws of Boolean Algebra, De Morgan's Theorems, Simplifications of Boolean expression (Numerical) **(8 hour, 16 Marks)**

Unit 4: Combinational logic Circuits: Introduction, Standard representation of Canonical forms: Sum of Product (SOP), Product of Sum (POS), Minterms and Maxterms, Conversion between SOP and POS
Karnaugh Map (K Map) Simplification: K map structure, Plotting K map, Representation of Boolean expression using K map (Grouping-Pair, Quad and Octet, overlapping and rolling), Don't care condition, Minimization of SOP expression (Up to 4 variables)
Numerical based on above topics **(8 hour, 16 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.
- Digital Fundamentals, Thomas L. Flyod, , Pearson Education Asia (1994)
- Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994)

ELECTRONICS LAB: DSC 1A LAB: Network Analysis and Basics of Digital Electronics Lab (60 clock hour)

ELE-103: ELECTRONICS LAB-I

(**Section A experiments are compulsory,** and students should perform at least **04** experiments from each **Section B & C** means total **10** experiments.)

Course Objectives:

Students are expected to:

1. Familiarize with basic electronics components, testing and measuring instruments.
2. Understand the practical use of various networks theorems
3. Study the electronics circuits analysis and verification of the circuits
4. Have the knowledge of passive filters and skill to build and test the circuits
5. Familiarize with logic gate ICs and have the knowledge of truth tables of logic gates.
6. Study various digital combinational circuits.

Section A: Circuit Components and Network Analysis	
1.	To familiarize with basic electronic components (Switch, fuse, Batteries, R, C, L, transformer, Relays, diodes, LED, transistors etc.), digital Multimeter, Function Generator and Oscilloscope.
2.	Measurement of AC (Amplitude, Frequency and Phase Difference) and DC (Voltage) signal parameters using Oscilloscope
Section B: Network Analysis and Semiconductor diode	
1.	Verification of Thevenin's theorem.
2.	Verification of Norton's theorem
3.	Verification of Superposition Theorem
4.	Verification of Reciprocity Theorem.
5.	Verification of the Maximum Power Transfer Theorem
6.	To study the properties of delta-star connection
7.	To study the characteristics of sine wave
8.	To study of passive low pass filter
9.	To study of passive high pass filter
10.	To study of passive band pass filter
11.	To study the series resonance circuit
12.	To study the series RL Circuit
13.	To study the series RLC Circuit
14.	To study the Parallel RLC Circuit

Section C: Basics of Digital Electronics	
1.	Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICS
2.	(a) Verification of Universal gates (NAND) (b) Verification of Universal gates (NOR)
3.	Verification of D-Morgan's Theorem
4.	(a) 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
5.	Study of Half Adder and Full Adder
6.	Study of Full Subtractor

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

Course Outcomes (COts):

	Course Outcomes	Cognitive level
	Handle various electronics devices	L2
	Build and test electronic circuits	L2
	Verify various network theorems	L2, L3
	Handle digital ICs and circuits	L2

Semester II

ELECTRONICS-DSC 1 B: Analog Electronics and Digital 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 digital integrated circuits.
2. To provide the knowledge and methodology necessary for using digital 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 digital 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 digital integrated circuit chips for innovative applications.
4. Model complex circuits and simulate them.
5. Handle simulation software to analyse analog and digital electronics circuits.

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

ELE-201: Analog Electronics (30 clock hour)

Course Content

Unit 1: 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. **(8 hour, 15 Marks)**

Unit 2: 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 a voltage regulator, Problems on Zener regulator **(8 hour, 15 Marks)**

Unit III: 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, Need of dc biasing, Biasing methods, dc load line and Q point.

(8 hour, 15 Marks)

Unit 4: Unipolar Devices

JFET. Construction, working and I-V characteristics (output and transfer), Pinch off voltage. JFET as an amplifier, Concept of MOSFET, UJT, basic construction, working, equivalent circuit and I-V characteristics. UJT as a relaxation oscillator. **(6 hour, 15 Marks)**

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Electronic Circuits: Discrete and Integrated, D.L. Schilling et. al. , 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: Digital Circuits (30 clock hour)

Course Content

Unit 1: Data Processing circuits

Idea of Multiplexing and DeMultiplexing, Multiplexer: 2 to 1, 4 to 1, DeMultiplexer: 1 of 2, 1 of 4, IC's of Multiplexer and Demultiplexer, Decoder: BCD to decimal decoder, Encoder: Decimal to BCD encoder using OR-gates. **(6 hour, 12 Marks)**

Unit 2: Flip-Flops

Introduction to sequential logic circuit, Comparison of Combinational and Sequential logic circuits, 1-bit memory cell, RS-FF using NAND and NOR gates, Clocked RS - FF, D- FF, JK - FF, Level and Edge triggered FF, PRESET and CLR, Race around condition, Master Slave J-K FF, T-FF, Difference between latch and flip flop **(8 Hours, 16 marks)**

Unit 3: Shift Register

Introduction to Shift Register, Classification of Register and Types of Registers: Serial in Serial out (SISO), Serial in Parallel out (SIPO), Parallel in Serial out (PISO), Parallel in Parallel out (PIPO), Universal shift register, Applications of Shift Register, Ring counter.

(6 Hours, 12 marks)

Unit 4: Counters

Concept of counter, Asynchronous counter (3-bit), Decade counter, Synchronous counter (3-bit), Comparison between Synchronous and Asynchronous counter, Down counter, Up-Down counter. **(5 Hours, 10 marks)**

Unit-5: Data Converters

Introduction, Need of ADC and DAC, Types of converters, Digital to analog converters (DAC): weighted resistor type and R-2R ladder type converter. Drawbacks of weighted resistor type DAC, Binary or R-2R type D to A convertor, Analog to Digital Converter: Simultaneous or Parallel ADC, Successive approximation type ADC. **(5 Hours, 10 marks)**

Reference Books:

- Digital principles and applications - A. P. Malvino & D. P. Leach
- Modem digital electronics - R. P. Jain
- Digital Electronics - William Gothman
- Digital fundamentals (3rd Edition)- Thomas Floyd

- 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 Digital Circuits Lab

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

(Students should perform at least any **05** experiments from each **Section A and B** means total **10** experiments.)

Course Objectives: **Students are expected to:** 1. Familiarize with various Semiconductor devices. 2. To understand the behavior of semiconductor devices. 3. Understand the practical use of various semiconductor devices. 4. Familiarize with combinational and sequential circuit ICs. 5. Design of various combinational and sequential circuits. **6.** Study various data processing circuits.	
Section A: Analog Electronics	
1.	Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
2.	Study of (a) Half wave rectifier (b) Centre-taped Full wave rectifier and (c) Bridge Full wave rectifier.
3.	To study Zener diode as a voltage regulator on the output of FWR.
4.	Study of the I-V Characteristics of BJT in CE configuration.
5.	Study of the I-V Characteristics of UJT.
6.	To design and Study of the UJT relaxation oscillator
7.	Study of the output characteristics of common source JFET.
8.	To study Transistor as a switch (LED ON/OFF)
Section B: Digital Circuits	
1.	Study of clocked R-S / D-type flip flop using logic gates.
2.	Study of JK / T- flip flop using logic gates/ICs.
3.	Study of 4:1 line multiplexer and 1:4 line demultiplexer.

4.	Study of decade counter using IC7490.
5.	Study of Up-down- counter using IC74191.
6.	Study of shift register using IC 7495.
7.	Study of DAC using R-2R ladder.
8.	To study BCD to Seven Segment Decoder using IC-7447/7448

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Basic Electronics, Bernod Grob, McGra-Hill, India.
- Applied Electronics, R. S. Sedha, S. Chand and Company, New Delhi.
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
- Solid State Electronic Devices, Ben G Streetman and S. Banerjee, Pearson Education
- Integrated Electronics, J. Millman and C. C. Halkias, Tata McGraw Hill (2001).
- Electronic Devices and Circuits, Allen Mottershead, Goodyear Publishing Corporation.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011) Tata McGraw
- Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994)
- Digital Electronics, S.K. Mandal (2010) 1st edition, McGraw Hill
- Digital System Design, M. Morris Mano, Pearson Education Asia,(Fourth Edition)

Course Outcomes (COts):

	Course Outcomes	Cognitive level
	Handle various semiconductor devices	L2
	Test basic electronic circuits	L2
	Understand the behavior and applications of semiconductor devices	L2, L3
	Handle digital ICs and circuits	L2

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	Circuit Components and Network Analysis	2	30	40	60	ELE 101: Network Analysis and Semiconductor Diodes
	ELE-102	Basics of Digital Electronics	2	30	40	60	ELE 102: Digital Integrated Circuits
	ELE-103	ELECTRONICS LAB -I	2	60	40	60	ELE-103: Electronics Lab I
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 201: Analog Electronics
	ELE-202	Digital Circuits	2	30	40	60	ELE – 202 – Linear Integrated Circuits
	ELE-203	ELECTRONICS LAB -II	2	60	40	60	ELE-103: Electronics Lab II