BAGALKOT UNIVERSITY

Mudhol Road, Jamkhandi-587301 Dist: Bagalkot

PROGRAM /COURSE STRUCTURE AND SYLLABUS
FOR

ELECTRONICS

as per the Choice Based Credit System (CBCS) designed in accordance with Learning Outcomes-Based Curriculum Framework (LOCF)

For

Bachelor of Science with ELECTRONICS

(General Degree)
I and II Semester

w.e.f.

Academic Year 2024-25

PROGRAM OBJECTIVES

The overall Objectives of the B.Sc. Electronics program are to:

- Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of electronics.
- Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in electronics.
- Develop abilities in students to design and develop innovative solutions for benefits of Society.
- Provide students with skills that enable them to get employment in industries or pursue Higher studies or research assignments or turn as entrepreneur.

PROGRAM OUTCOMES

- Ability to apply knowledge of Logic thinking and basic science for solving electronics related Problems.
- Ability to perform electronics experiments, as well as to analyze and interpret data.
- Ability to design and manage electronic systems or processes that conforms to a given specification within ethical and economic constraints.
- Ability to identify, formulate, solve and analyze the problems in various sub disciplines of electronics.
- Ability to use Modern Tools / Techniques.

PROGRAM STRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years B.Sc. with Electronics Undergraduate Programme with effect from 2024-25

First Semester B.Sc. (Electronics) Scheme

SEMESTER-I											
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/ week**			**Credits**	**Duration of Exam** (Hrs)	**Teaching Department**
			IA	**SEE**	**Total**	**L**	**T**	**P**			
L1	------	Language 1	20	80	100	4	-	-	3	3	--------
L2	-------	Language 2	20	80	100	4	-	-	3	3	----------
Major	2A1ELEM01T	Network Analysis And Instrumentation	20	80	100	4	-	-	3	3	Electronics
	2A1ELEM01L	Practical I	10	40	50	-	-	4	2	3	Electronics
Major	----------	Major Subject 2	20	80	100	4	-	-	3	3	---
	----------	Practical	10	40	50	-	-	4	2	3	---
Major	----------	Major Subject 3	20	80	100	4	-	-	3	3	---
	----------	Practical	10	40	50	-	-	4	2	3	---
Common	2S1XXXC01T	Constitutional Values/	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment studies									Environmental Studies: Chemistry/ /Geography/ Botany
Total Marks					**700**	**Semester Credits**			**23**		

Second Semester B.Sc. (Electronics) Scheme

	SEMESTER-II										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/ week**			**Credits**	**Duration of exams (Hrs)**	**Teaching Department**
			IA	**SEE**	**Total**	**L**	**T**	**P**			
L3	----------	Language 3	20	80	100	4	-	-	3	3	---------
L4	----------	Language 4	20	80	100	4	-	-	3	3	----------
Major	2A2ELEM02T	Electronic Circuits and Special Purpose Devices	20	80	100	4	-	-	3	3	Electronics
	2A2ELEM02L	Practical II	10	40	50	-	-	4	2	3	Electronics
Major	-----	Major Subject 2	20	80	100	4	-	-	3	3	--------
	-------	Practical	10	40	50	-	-	4	2	3	---------
Major	--------	Major Subject 3	20	80	100	4	-	-	3	3	--------
	-------	Practical	10	40	50	-	-	4	2	3	---------
Common	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/Geography / Botany
Total Marks					**700**	**Semester Credits**			**23**		

First Semester B.Sc. (Electronics)

Course outcomes

At the end of the course the student should be able to:

- CO1: Apply the knowledge of basic circuit law and simplify the network using reduction techniques
- CO2: Analyze the circuit using Kirchhoff's and Study and analyze basic networks using network theorems in a systematic manner
- CO3: Build simple electronic circuits used in various applications
- CO4:Describe the various types of passive filters
- CO5:Students should be able to know about the use of the instruments

First Semester B.Sc. (Electronics)

Paper Code: 2A1ELEM01T Paper Title: Network Analysis And Instrumentation			
Teaching Hours/week: 4	Formative Assessment Marks: 20 Summative Assessment Marks:80 Total Marks= 100	Total Hours: 52	Credits: 3

UNITS	Syllabus	Teaching Hours
I	• **Electronic Components**: Electronic passive and active components, types and their properties, Concept of Voltage and Current Sources, electric energy and power (Qualitative only) • .**DC Transient Analysis:** Series RC Circuit- Charging and discharging with initial charge, RC time constant. Series RL circuit, current at any instant during growth and decay– equations (qualitative analysis only). Graphical representation, RL time constant, AC applied to Series RC and RL circuits: Impedance of series RC & RL circuits (qualitative study-no derivations). AC applied to Series and parallel RLC circuit (qualitative study–no derivations), series and parallel resonance, condition for resonance, resonant frequency, bandwidth, significance of quality factor, Comparison between series and parallel resonance numerical problems. • **Transformer:** Principle, construction and working. • **Switches:** SPST, SPDT, DPST and DPDT, fuse and Electromagnetic relay, MCB and ELCB, RCCB–Qualitative studies only. • **Problems**	13
II	• **Network theorems (DC analysis only**): Review of Kirchhoff's laws, voltage divider and current divider theorems, open and short circuits. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Problems. • **Two Port Networks:** h, y and z parameters and their conversion. • **Problems**	13

III	• T and pi Networks, Network transformation T to pi and vice versa. Characteristic impedance. • **Filters**-Concept of filters, Constant K-type filters- Low pass filter, high pass filters, Derivation (Design impedance, Characteristic impedance, Cut off Frequencies, Attenuation constant and Phase constant) and design of filters. Band pass filters & band elimination. (Qualitative only) • Problems	13
IV	• Suspension Galvanometer, Torque and deflection of the Galvanomete permanent –magnet-moving mechanism, • DC Ammeters, Multirange DC ammeter DC Voltmeters, Voltmeter sensitivity, DC Mutirange Voltmeter , • **Ohmmeter:** Series type ohmmeter, Shunt type ohmmeter, **Analog** multi-meter or VOM. Digital Multimeter, Advantages • **Cathode Ray Oscilloscope:** Block diagram, Cathode Ray Oscilloscope. • **Problems**	13
	Reference Books: 1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9thEdition, 2013, PHI 2. Basic electronics- B.L. Theraja - S. Chand and Co. 3rd edition - 2012. 3. Electronics text lab manual, Paul B. Zbar. 4. Electric circuits, Joeseph Edminister, Schaums series. 5. Electric circuits Book 1, Schaums series - Syed. A. Nasar. Mc-Graw hill edition. 6. Basic Electronics and Linear circuits, N.N. Bhargava, D.C. Kulshresta and D.C Gupta-TMH. 7. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ. 8. Principles of Electronics By- V.K. Mehta, S. Chand& Co. 9. Electronic devices, applications and Integrated circuits, Mathur,Kulshreshta and Chadha, Umesh Publications. 10. Modern Electronic Instrumentation and Measurement techniques- Albert D. Helfrick and William D. Cooper	

B.Sc. I semester Practical

Course out comes
After the completion of the lab course the student will be able to:

- CO1:.Illustrate electrical network theorems.
- CO2;Evaluate time constant of RC circuits
- CO3:.Analyze network parameter for different application.
- CO4.: Design different filters
- CO5:Design the analog Voltmeter Ammeter and Ohmmeter

Paper Code: 2A1ELEM01L **Paper Title: Practical – I**		
Lab Hours /week: 4 Total 50 hours	Formative Assessment Marks: 10 Summative Assessment Marks:40 Total Marks= 50	Credits: 2

Syllabus

Demonstration experiments- not for evaluation

1. To familiarize with basic electronic components (R, C, L,), digital Multimeter, Function Generator and Oscilloscope.
2. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.

Experiments to be performed

1. Series Resonance
2. Verification of Kirchhoff's Laws
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. RC Circuits: Time Constant, Differentiator, Integrator.
7. Determination of hybrid parameters of a two-port network.
8. Studyof Low pass filter T/π section.
9. Studyof High pass filter T/π section.
10. Studyof Band pass filter T section
11. Studyof Band Elimination filter T/π section
12. Conversion of Galvanometer into Multirange voltmeter
13. Conversion of Galvanometer into Multirange milliammeter
14. Design of Ohmmeter

Note:

1. Experiments are of four hours duration
2. Minimum of eight experiments to be performed.

Second Semester B.Sc. (Electronics)

Second Semester B.Sc. (Electronics)

Course outcomes:

At the end of the course the student should be able to

CO1: Describe the behavior of basic semiconductor devices

CO2: Calculate various device parameters' values from their V I characteristics.

CO3: Students should be able to bias the transistor using different biasing circuits

CO4: Describe the frequency response of BJT , JFET amplifiers and Power Amplifiers

CO5: Explain the behavior, characteristics and applications of special purpose devices, LED, LCD, Solar Cells, UJT, SCR, Triac and Diac.

Paper Code: **2A2ELEM02T** Paper Title: **Electronic Circuits and Special Purpose Devices**			
Teaching Hours/week: 4	Formative Assessment Marks: 20 Summative Assessment Marks:80 Total Marks= 100	Total Hours: 52	Credits: 3

UNITS	Syllabus	Teaching Hours
I	• **Junction Diode and its applications:** PN junction diode (Ideal and practical) constructions, Formation of Depletion Layer, Diode Equation and I-V characteristics. , Zener diode, Reverse saturation current, Zener and avalanche breakdown. • **Rectifiers**- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms (Definition of TUF, PIV and expression for efficiency (η), ripple factor(γ) and voltage regulation), Comparison between HWR & FWR. • **Filter**- Inductor filter, Capacitor filter, LC filter (Inductor Input) and π-section filter (Capacitor Input) Qualitative study only.. • **Switching Circuits:** Clipping circuits (Positive, Negative and both side), Clamping circuits (Positive & Negative).	13
II	• **Bipolar Junction Transistor:** Bipolar Junction Transistor: Construction, working and characteristics of three modes (CB, CE and CC), relation between α, β and γ. Regions of operation (active, cut off and saturation). Problems. • **Transistor biasing:** Need for biasing, DC load line, operating point, thermal runaway, stability and stability factor. Different types of biasing– Fixed bias, Collector to base bias, Emitter feedback bias, Voltage divider bias, (Explanation Q point derivation. advantages& disadvantages in each case). Transistor as a switch circuit and working. • Problems.	13

III	• **Small Signal Amplifiers:** Classification of amplifiers based on different criteria, small signal CE amplifier-circuit, working, frequency response. • **Cascaded Amplifiers:** Two stage RC Coupled Amplifier and its Frequency Response. • **Hybrid model**: h-parameter, Determination of h-parameter of transistor for CE configuration, derivation for Av, expressions for Zin and Zout using h-parameters. Numerical problems on Av, Zin and Zout. • **Power amplifier:** Introduction, Classification of power Amplifiers, Conversion efficiency of class A amplifier, class B amplifier and class C amplifier (Qualitative only). Transformer coupled push pull amplifier. • **FET:** Introduction, FET types, JFET – construction, working, characteristics, parameters and their relationships. Comparison of BJT & FET. • **JFET Amplifier:** Common Source – mode, operation and frequency response • **MOSFET**-Types, circuit symbols of depletion type MOSFET (both N channel and P Channel). Circuit symbols of enhancement type MOSFET (both N channel and P channel).N channel enhancement type MOSFET-construction, working, characteristic curves • **Problems**	13
IV	• **UJT-** Basic construction, equivalent circuit, intrinsic standoff ratio, working, characteristics and relaxation oscillator-expression of frequency. Numerical problems. • **SCR**-construction, working, characteristic curves, explanation of working by using equivalent circuit, full wave-controlled rectifier-derivations for average values of load current and voltage, numerical problems. • **Triac and Diac** – Circuit symbol, construction, working, characteristic curves. Applications (mention only). • **LED**– Circuit symbol, operation and applications (mention only) • **LCD –**Types, applications (mention only), advantages over LED. • **Special purpose devices:** Tunnel diode, Varactor diode, Photo diode, Photo transistor & Solar cell – circuit symbol, working, characteristics, applications (mention only). • **Problems**	13

REFERENCE BOOKS:

1. Basic electronics- B.L. Theraja - S. Chand and Co. 3rd edition -2012.
2. Electronics text lab manual, Paul B. Zbar.
3. Basic Electronics and Linear circuits, N.N. Bhargava, D.C. Kulshresta and D.C Gupta-TMH.
4. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
5. Principles of Electronics By V.K. Mehta, S. Chand& Co.
6. Electronic devices, applications and Integrate circuits, Mathur, Kulshreshta andChadha,UmeshPublications.
7. Basic electronics &linear circuits TTTI Chandigarh-Kulashresta and Bhargava Tata McGrawhill publication
8. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI
9. Semiconductor devices –Kannan Kano LPE Pearson publication.
10. Electronic devices, applications and Integrated circuits, Mathur,

B.Sc. II semester Practical

Course out comes

After the completion of the lab course the student will be able to:

- CO1: Describe the characteristics of basic electronic devices.
- CO2: Explain the behavior and characteristics of power devices such as UJT, SCR, etc.
- CO3: Explain about the biasing circuits
- CO4: Explain the frequency response of Transistor amplifier and FET amplifier

Paper Code: 2A2ELEM02L **Paper Title: Practical – II**		
Lab Hours/week: 4 Total Marks= 50	Formative Assessment Marks: 10 Summative Assessment Marks:40	Credits: 2
Syllabus		

Section-A: Demonstration experiments- not for evaluation

Measurement of voltage, time period and frequency using C.R.O.

Section-B: Performance Experiments

1. Study of the I-V Characteristics of (a) P-N junction Diode, and (b) Zener diode.
2. Full wave bridge rectifier with LC/π -section filter.
3. Study of Clipping and Clamping circuits
4. Transistor Characteristics in CE mode
5. Fixed Bias circuit using transistor
6. Voltage Divider Bias circuit using transistor
7. FET characteristics
8. CE Amplifier – frequency response
9. Common source FET amplifier- frequency response
10. UJT characteristics
11. UJT relaxation oscillator.
12. SCR characteristics.
13. LED Characteristics
14. Solar cell characteristics

Note:

1. Experiments are of three hours duration
2. Minimum of eight experiments to be performed

Summative Assessment: Scheme of Evaluation for Practical Examination

SL. No	Particulars	Marks Allotted
1.	Basic formula with description, nature of graph if any & indication of unit	04
2.	Tracing of schematic ray diagram/Circuit diagram with description	04
3.	Tabulation	04
4.	Experimental skill & connection	04
5.	Record of observation and performance of experiment	08
6.	Calculation including drawing graph	06
7.	Accuracy of result with unit	02
8.	Journal assessment	04
9.	Oral performance	04
	Total	40