B.Sc. Electronics
Semester: IV (Major)

Course Code	US04MAELE01	Title of the Course	Instrumentation
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The course is to make the students understand the fundamentals of Measurement systems and the units of measurements, AC/DC measuring instruments, transducers and their interfacing with the Bridges used for R-L-C-F measurements.

Course Content		
Unit	**Description**	**Weightage In %**
1.	**Measurement and error:** Definitions, Accuracy and Precision, Significant figure, Types of errors: Gross errors, Systematic errors, Random errors, Statistical analysis: Arithmetic Mean, Deviation from the mean, Average deviation, Probability of errors: Normal distribution of errors, Probable error, Limiting errors	**25**
2.	**Electro mechanical indicating instruments:** Suspension Galvanometer, Steady state deflection, Dynamic behaviour, PMMC, D'Arsonval movement, Construction, DC Emitters, Shunt resistor, Ayrton shunt, DC voltmeters; multiplier resistance, Multi range voltmeter, Voltmeter sensitivity, Series – shunt type Ohm meters.	**25**
3	**Bridge Measurements:** Wheatstone bridge, Kelvin bridge, AC bridges and their applications: Conditions for bridge balance, Applications of the balance equations, Maxwell bridge, Hay bridge, Schering bridge, Unbalance conditions, Wien bridge	**25**
4	**Transducers:** Classification of transducers, Selecting a transducer, strain gages: gage factor, Metallic sensing elements, Gage configuration, Unbonded strain gage, Displacement transducers: Capacitive transducer, Inductive transducer, Variable differential transformer transducer, Temperature measurements: Resistance Thermometer, Thermocouples, Thermistor; characteristics and Applications.	**25**

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the measuring systems and units used for different systems..
2.	Understand various measuring instruments for measuring AC/DC quantities..
3	Understand the Bridges for measurement of R-L-C-F.
4	Understand the effect of various physical quantities like pressure and Temperature on electrical parameters of electronics components and their measurements.

Suggested References:	
Sr. No.	References
1.	Modern Electronic instrumentation and Measurement Techniques By Albert D. Halftrack & William D. Cooper
2.	Instrumentation Devices & Systems By C. S. Rangan, G. R. Sarma & V.S.V. Mani

On-line resources to be used if available as reference material
On-line Resources

B.Sc. Electronics
Semester: IV (Major)

Course Code	US04MAELE02	Title of the Course	Digital Electronics – 2
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The course is to make the students understand the Digital combinational circuits and their applications as Flip Flops, Registers, Counters and Memories.

Course Content		
Unit	**Description**	**Weightage In %**
1.	**Flip - Flops:** The S–R latch, Gated S–R Latches, The gated D latch, Edge–triggered flip–flops, The edge–triggered D Flip–Flop, The edge–triggered R–S Flip–Flop, The edge–triggered J–K Flip–Flop, The edge–triggered T Flip–Flop, Asynchronous inputs, Flip–Flops operating Characteristics, Master–Slave Flip–Flops Conversion of Flip–Flops, Applications of Flip–Flops, Schmitt trigger	**25**
2.	**Registers:** Buffer register, Controlled buffer register, Data transmission in shift register, Serial–in Serial out , shift register, Serial–in Parallel–out , shift register, Parallel–in Serial–out , shift register, Parallel–in Parallel–out , shift register, Bidirectional Shift register, Applications of Shift registers, Universal Asynchronous receiver Transmitter	**25**
3	**Counters:** Asynchronous counters (ripple counters), Synchronous counters, Ring counters, Mod – 10 counter, Up – Down counter, three state registers, bus organised computers	**25**
4	**Memories:** ROMs: ROM, PROM, EPROM, EEPROM RAMs: static RAM, Dynamic RAM, ECL RAM Magnetic memory: Magnetic core memory, Magnetic disk memory, Magnetic recording formats, Hard disk systems, Magnetic tape memory, Magnetic bubble memory, Optical disk memory	**25**

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the construction of Flip Flops from logic gates and working of various Flip Flops.
2.	Understand construction of registers using Various Flip Flops.
3	Understand construction of Counters using Various Flip Flops.
4	Understand different types of primary and secondary memories.

Suggested References:	
Sr. No.	References
1.	Fundamentals of Digital Circuits By Anand Kumar
2.	Digital Computer Electronics By Malvino and Brown.

On-line resources to be used if available as reference material
On-line Resources

B.Sc. Electronics Semester: IV (Major)
Practicals

Course Code	US04MAELE03	Title of the Course	Electronics Practicals.
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	

Part -1

Course Content		
No	**Title of Practical**	
1.	Wheatstone bridge	
2.	Kelvin bridge	
3.	Maxwell Bridge	
4.	Hay bridge	
5.	Schering bridge	
6.	Characteristics of Thermistor	
7.	LVDT	
8.	Thermocouple	
	Other experiments based on Theory.	

Part -2

Course Content		
No	**Title of Practical**	
1.	Flip – Flops	
2.	Synchronous counters	
3.	Asynchronous counters	
4.	Registers	
5.	RAM	
6.	Other experiments based on Theory.	

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Helps to understand the various biasing circuits of transistors circuit.
2.	Make students understand characteristics of transistor and its application as an amplifier.
3.	Helps the student to understand positive and negative feedback effect in transistorised circuit.

Suggested References:	
Sr. No.	References
1.	Modern Electronic instrumentation and Measurement Techniques By Albert D. Helfrick & William D. Cooper
2.	Instrumentation Devices & Systems By C. S. Rangan, G. R. Sarma & V.S.V. Mani
3.	Fundamentals of Digital Circuits By Anand Kumar
4.	Digital Computer Electronics By Malvino and Brown.

On-line resources to be used if available as reference material
On-line Resources

B.Sc. Electronics
Semester: IV (Minor)

Course Code	US04MIELE01	Title of the Course	Transistor Circuits.
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	The course is to make the students understand the fundamentals of Transistor, their characteristics and biasing.

Course Content		
Unit	**Description**	**Weightage In %**
1.	**Transistors:** Structure of Transistor, Working, Transistor Amplifying Action, Configurations, Input and Output characteristics of CB, CE and CC configurations. Comparison of three configurations.	**50**
2.	**Transistor Biasing:** Basic CE amplifier circuit, DC Load Line, Why bias a transistor?, Selection of operating point, Need for Bias Stabilization, Requirements of Biasing circuit, Different Biasing circuits, Fixed Bias circuit, Collector to base bias Circuit, Bias Circuit with Emitter Resistor, Voltage divider Biasing Circuit. Emitter Bias Circuit.	**50**

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%

3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the construction of transistors their characteristics, various configurations and parameters in different modes.
2.	Understand biasing a transistor for various applications.

Suggested References:	
Sr. No.	References
1.	Basic Electronics and Linear Circuits By Bhargava, Kulshreshtha and Gupta.
2.	Electronics Devices and Circuits By David A. Bell.

On-line resources to be used if available as reference material
On-line Resources

B.Sc. Electronics Semester: IV (Minor)
Practicals

Course Code	US04MIELE02	Title of the Course	Electronics Practicals.
Total Credits of the Course	2	Hours per Week	4

Course Objectives:	

Course Content		
No	**Title of Practical**	
1.	Study of Transistor fixed bias circuit with and without emitter resistor	
2.	Study of Transistor collector to base bias circuit	
3.	Study of Transistor potential divider bias circuit	
4.	PNP transistor Characteristics	
5.	NPN transistor Characteristics	
6.	Single stage CE amplifier frequency response	
7.	Other experiments based on Theory.	

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Helps to understand the various biasing circuits of transistors circuit.
2.	Make students understand characteristics of transistor and its application as an amplifier.
3.	Helps the student to understand positive and negative feedback effect in transistorised circuit.

Suggested References:	
Sr. No.	References
1.	Basic Electronics and Linear Circuits By Bhargava, Kulshreshtha and Gupta.
2.	Electrical Engineering Fundamentals By Del Toro.

On-line resources to be used if available as reference material
On-line Resources

B.Sc. Electronics
Semester: IV (Skill Enhancement)

Course Code	US04SEELE01	Title of the Course	Renewable Energy Sources
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make the students aware about the different renewable energy sources such as solar, geothermal, wind and fuel cells and technological advancements in this field. To make the students aware of the importance of using nonconventional energy resources and their utilization for the present day and future energy needs.

Course Content		
Unit	**Description**	**Weightage In %**
1.	**Solar Thermal Energy Conversion Systems:** Introduction-Subsystems, Solar Thermal Collectors, Characteristics features of a collectors, Important aspects of solar thermal Collectors, Collector Efficiency, Simple Flat plate Collectors, Installation of Flat Plate Collectors, Guidelines for Installation, Shadow Effect, Cosine loss factor and reflective Loss Factor, Heliostats with Central Receiver, Heat Transfer-fluid. Solar Photovoltaic Systems: Introduction to Photovoltaic systems, Merits and Limitations of Solar PV Systems, V-I characteristics of Solar Cell and Efficiency of a solar cell, Configuration of a solar PV Panel, Small and Large PV systems.	**50**
2.	**Geothermal Energy and Wind Energy:** Fundamentals and Applications Geothermal Energy: Introduction, Application, Geothermal Energy Resources, Origin of Geothermal Resources, Hydro Geothermal Resources. **Wind Energy:** Fundamentals and applications: Introduction of Wind Energy, Wind power density, Power in a wind stream, Wind turbine Efficiency, Power of a wind Turbine for given incoming Wind Velocity, Types of wind turbine –Generator Units, Mono Blade Horizontal axis Wind turbine (HAWT), Twin- Blade Horizontal axis Wind turbine (HAWT) and Three-Blade Horizontal axis Wind turbine (HAWT). **Tidal Energy Conversion and Ocean Energy:** Technology Tidal Energy Conversion: Introduction-Tidal range, high and low Tides, Tidal Energy Conversion, Tidal Power Ocean Energy Technology: Introduction to Energy from Ocean, Ocean Energy Resources, Ocean Thermal Energy, Ocean Waves, Ocean Tides, Advantages and Limitations of Ocean Energy Conversation Technologies, Ocean Energy Routes.	**50**

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	
3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	The various sources of renewable energy and their conversion methods.
2.	They will be able to gain the knowledge of various fuel cells and power plants.

Suggested References:	
Sr. No.	References
1.	Instrumentation Measurement and Analysis By B C Nakra and K K Chaudhary Tata McGraw Hill Publishing Co. Ltd., New Delhi
2.	Biomedical Instrumentation By R S Khandpur (2nd Edition) Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3.	Energy Technology Nonconventional, Renewable and Conventional By S Rao and Dr. B B Parulekar Khanna Publishers.

On-line resources to be used if available as reference material
On-line Resources

Bachelor of Science
Electronics
Semester: IV
(Skill Enhancement)

Course Code	US04SEELE02	Title of the Course	Digital Electronics Practicals
Total Credits of the Course	2	Hours per Week	4

Course Objectives:	The course is to make the students understand the various Logic Gates, various Flip flops, Counters and their applications.

No	Title of Practical	
1.	Logic gates using discrete component	
2.	Logic gates using ICs	
3.	X – OR AND X- NOR gate applications	
4.	Half and Full adder	
5.	Half and Full subtractor	
6.	Flip - Flop	
7.	Asynchronous counter	
8.	Synchronous counter	
9	Astable multivibrator	
10	7 – segment LED display	

Teaching-Learning Methodology	Online and Board work

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	-

2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	-
3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Helps to understand Digital Electronics.
2.	Make students understand basic concept of digital circuits.
3.	Helps the student to understand working of arithmetic and logic unit of computer system. .

Suggested References:	
Sr. No.	References
1	Digital Integrated Electronics By : Herbert Taub & Donald Schilling
2.	Digital principle and applications by D. P. Leach, A. P. Malvino and G. Saha, 8th Ed., McGraw Hill Education, 2014
3.	Fundamentals of Digital Circuits By Anand Kumar
4.	Digital Computer Electronics By Malvino and Brown.

On-line resources to be used if available as reference material
On-line Resources