
**Shiksha Mandal's
BAJAJ COLLEGE OF SCIENCE, WARDHA.
(Formerly, Jankidevi Bajaj College of Science, Wardha)
Syllabus For
Undergraduate Programme (B.Sc.) Electronics Major**

Program description:

Op-Amp, Power Supply, IC 555 and Circuit Maker are the fundamental areas of study in electronics that are concerned with the behaviour and manipulation of electronic signals. This course covers the principles, techniques, and applications of both analogue and digital electronics.

Throughout the course, students will gain hands-on experience with electronic circuit. Emphasis will also be placed on the analysis and interpretation of circuit behaviour through experimental testing.

Upon completion of this course, students will have a strong understanding of analogue and digital electronics, electronic Instrumentation, electronic communication, microprocessor, 'C' language, Microcontroller 8051 and will be able to apply this knowledge to the design and implementation of a wide range of electronic systems.

Programme Objective:

The objectives of the B.Sc. program (Electronics major) are:

1. To prepare students for successful careers in the electronics industry as electronic circuit designers, electronics consultants, testing professionals, and entrepreneurs.
2. To provide students with the necessary knowledge and skills to compete for advanced degree programs such as M.Sc. (Electronics) and other related fields of study. Upon completion of the program, graduates should be equipped with the foundational knowledge and practical skills required for further academic and professional development in the field of electronics.

Programme Outcomes:

Upon completion of the B.Sc. program (Electronics major), graduates will have the following outcomes:

1. Possess a solid understanding of the core subjects in electronics, including electronic components, electronic measuring and testing instruments, analogue and digital ICs, electronic circuit design and implementation, and troubleshooting and maintenance of electronic and electrical devices.
2. Demonstrate proficiency in assembly language and high-level language programming, as well as interfacing electronic devices with computers and other systems.
3. Be equipped with the knowledge and skills needed to develop industrial and entrepreneurial applications in the field of electronics, and to contribute to the advancement of the industry through innovation and problem-solving. Graduates will be well-prepared to enter the workforce as electronics professionals, or to pursue advanced studies in the field.

SYLLABUS AS PER NEP-2020 FOR B.Sc. SEMESTER III (ELECTRONICS)

TO BE IMPLEMENTED FROM ACADEMIC SESSION 2024-25

APPROVED IN BoS MEETING HELD ON 26/03/2024.

B.Sc. PART II - SEMESTER III
Course Name: Major: Electronics DSC – III

Credits: 6 (4 Th, 2 Pr)

No. of Lectures: 60

No. of Practical Hrs.: 60

Course Description:

The third semester of the UG course focuses on basic Op-Amp, Power Supply, IC 555 and Circuit Maker, which deals with operation of basic of OP Amp, its applications, power supplies, URPS, RPS and circuit maker.

Course Objective and Course Outcome Framework

SN	Course Objectives	Course Outcomes
	Students will try to learn:	After successful completion of the course student will be able to:
1.	To understand the concepts, working principles and key parameters of operational amplifier.	Understand the fundamentals and working principles of operational amplifier.
2.	To perform analysis of operational amplifier circuits based on negative and positive feedback applications.	Demonstrate the ability to design practical circuits based on negative and positive feedback applications that perform the desired operations.
3.	To understand operation of rectifier, filter, regulator and various parameters associated with power supply.	Understand the concept and operation of rectifier, filter, regulator, and various parameters associated with power supply.
4.	To understand operation of regulated power supply and apply concepts for the design of regulated power supply.	Analyze and assemble regulated power supply using 78XX and 723 IC.
5.	To understand the operation and use of 555 timer IC.	Analyze and assemble various timer circuits using 555 IC.
6.	To study the analysis of circuit design using circuit maker simulation software.	Understand the behavior of the electronic circuits.

B.Sc. PART II - SEMESTER III**Course Name: Major: Electronics DSC – III****Paper Name: Op-Amp, Power Supply, IC 555 and Circuit Maker****Course Code: UEL230T****Course Outline****Unit I**

RC coupled amplifier, Advantages and disadvantages, DC coupled amplifier, Advantages and disadvantages, Difference amplifier, need of two power supplies, working of difference amplifier, differential mode gain, common mode gain, CMRR., Block diagram of OPAMP, Parameters of OP AMP and characteristics of an ideal OP AMP, Open and closed loop operation.

Unit II

Applications of OPAMP: Concept of virtual ground, OP AMP as an inverting amplifier, Sign changer circuit, non-inverting amplifier, Unity gain amplifier, Adder, Subtractor, Integrator, Differentiator, Comparator, zero crossing detector, Schmitt trigger.

Unit III

Introduction to power supply: Half wave, full wave, and bridge rectifier, Concept of filter (capacitive). Introduction to unregulated, regulated power supply, Power supply parameters: Ripple factor, Efficiency, Line regulation, Load regulation, Zener regulator, Regulated power supply design using series pass transistor, short circuit protection.

Unit IV

General features of IC regulators, design of fixed and variable power supply, 78xx, 79xx, LM 317, Design of dual power supply, LM 317 as variable regulator, Limitations of linear regulator, Switching regulator- (SMPS), Concept of Low Drop Out regulator (LDO).

Unit V

Timer IC 555: Pin and functional diagrams of IC 555, Description of functional diagram, Monostable multivibrator using IC 555, applications in monostable mode (missing pulse detector, linear ramp generator, frequency divider and pulse width modulation) and Astable multivibrator using IC 555, Applications in astable mode (FSK generator, pulse position modulator), Schmitt trigger using IC 555.

Unit VI

Introduction to circuit maker, basics, accessing tools & features, saving schematic options, file management, drawing a schematic, creating simple RC circuit, setting up the analysis, running the simulation, mix signal simulation example. Digital logic simulation, setting of parameters, analysis of simple circuits.

B.Sc. II (SEM III) ELECTRONICS PRACTICALS**Course Name: Major: Electronics DSC – III****Paper Name: Op-Amp, Power Supply, IC 555 and Circuit Maker****Course Code: UEL230P**

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of Op-amp as inverting and sign changer amplifier.
2. Study of Op-amp as Non-inverting and unity gain amplifier.
3. Op-amp as adder and averaging amplifier.
4. Op-amp as difference amplifier. (Subtractor)
5. Op-amp as Integrator.
6. Op-amp as Differentiator
7. Op-amp as comparator and zero crossing detector.
8. Op-amp as Schmitt trigger.
9. Study of Half wave rectifier.
10. Study of Full wave rectifier.
11. Study of Full wave Bridge rectifier.
12. Study of Zener regulator.

Section B

1. Study of 78XX series regulators
2. Study of 79XX series regulators
3. Study of LM317regulator
4. Study of astable multivibrator using IC555
5. Study of monostable multivibrator using IC555
6. Study of linear ramp generator using IC555
7. Frequency divider using IC555
8. Study transient & AC analysis of RC circuit
9. Study transient & AC analysis of different OP-Amp as comparator
10. Study transient & AC analysis of different OP-Amp as inverting amplifier
11. Study CE amplifier parameters
12. Study of MOSFET Characteristics

REFERENCE BOOKS

1. Principles of Electronics, V. K. Mehta, Rohit Mehta
2. Functional Circuits in Electronics, S. G. Pimpale, Sushama Pimpale, Mcmillan India Ltd.
3. Elementsofelectronics M.K.Bagde,S.P.Singh,KamalSingh,S.Chand
4. Op-Amp and Linear Circuits, Gaikwad, PHI
5. Electronic Instrumentation, Khedkar
6. Basic Electronics and Linear Cicuits, Bhargava, Kulshreshtha, Gupta, Technical education series
7. Electronic Devices & Circuits I& II, A. P. Godse, U. P. Bakshi Technical Publishers, Pune.
8. Analogue and Digital technique, Navneeth, Kale. Gokhale,
9. Instrumentation devices and circuits, Rangan, Mani, Sharma
10. Linear Integrated Circuit by D. Roy Chaudhary
11. Op-Amps and Linear Integrated Circuits by Ramakant Gaikwad
12. Circuit maker manual.

Web Resources

1. Students are advised to make use of the resources available on the internet. Some useful links related to electronics are given below.
2. M.I.T. open course ware video lectures are available at<http://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/VideoLectures/index.htm>
3. www.electronics-tutorials.com
4. www.science-ebooks.com/electronics
5. <http://computer.howstuffworks.com>
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. [http://101 science.com/eleclinks.htm](http://101science.com/eleclinks.htm)
8. www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
9. www.discovercircuits.com/resources/tutorials.html

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1. Possess a solid understanding of the core subjects in electronics, including electronic components, electronic measuring and testing instruments, analogue and digital ICs, electronic circuit design and implementation, and troubleshooting and maintenance of electronic and electrical devices.
2. Demonstrate proficiency in assembly language and high-level language programming, as well as interfacing electronic devices with computers and other systems.
3. Be equipped with the knowledge and skills needed to develop industrial and entrepreneurial applications in the field of electronics, and to contribute to the advancement of the industry through innovation and problem-solving. Graduates will be well-prepared to enter the workforce as electronics professionals, or to pursue advanced studies in the field.

B.Sc. PART II - SEMESTER III

Course Name: Electronics Minor - III
Paper Name: Op-Amp, Power Supply and IC 555
Course Code: UEL231T

Credits: 6 (4 Th, 2 Pr)**No. of Lectures: 60****No. of Practical Hrs.: 60****Course Description:**

The third semester of the UG course focuses on basic Op-Amp, Power Supply, IC 555 and Circuit Maker, which deals with operation of basic of OP Amp, its applications, power supplies, URPS, RPS and circuit maker.

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5.	To understand the operation and use of 555 timer IC.	Analyze and assemble various timer circuits using 555 IC.

B.Sc. PART II - SEMESTER III

Course Name: Electronics Minor - III
Paper Name: Op-Amp, Power Supply and IC 555
Course Code: UEL231T

Course Outline**Unit I**

RC coupled amplifier, Advantages and disadvantages, DC coupled amplifier, Advantages and disadvantages, Difference amplifier, need of two power supplies, working of difference amplifier, differential mode gain, common mode gain, CMRR., Block diagram of OPAMP, Parameters of OP AMP and characteristics of an ideal OP AMP, Open and closed loop operation.

Unit II

Applications of OPAMP: Concept of virtual ground, OP AMP as an inverting amplifier, Sign changer circuit, non-inverting amplifier, Unity gain amplifier, Adder, Subtractor, Integrator, Differentiator, Comparator, zero crossing detector, Schmitt trigger.

Unit III

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Unit IV

General features of IC regulators, design of fixed and variable power supply, 78xx, 79xx, LM 317, Design of dual power supply, LM 317 as variable regulator, Limitations of linear regulator, Switching regulator- (SMPS), Concept of Low Drop Out regulator (LDO).

Unit V

Timer IC 555: Pin and functional diagrams of IC 555, Description of functional diagram, Monostable multivibrator using IC 555, applications in monostable mode (missing pulse detector, linear ramp generator, frequency divider and pulse width modulation) and

Unit VI

Astable multivibrator using IC 555, Applications in astable mode (FSK generator, pulse position modulator), Schmitt trigger using IC 555.

B.Sc. II (SEM III) ELECTRONICS PRACTICALS

Course Name: Electronics Minor - III
Paper Name: Op-Amp, Power Supply and IC 555
Course Code: UEL231P

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of Op-amp as inverting and sign changer amplifier.
2. Study of Op-amp as non-inverting and unity gain amplifier.
3. Op-amp as adder and averaging amplifier.
4. Op-amp as difference amplifier. (Subtractor)
5. Op-amp as Integrator.
6. Op-amp as Differentiator
7. Op-amp as comparator and zero crossing detector.
8. Op-amp as Schmitt trigger.
9. Study of Half wave rectifier.
10. Study of Full wave rectifier.
11. Study of Full wave Bridge rectifier.
12. Study of Zener regulator.

Section B

1. Study of 78XX series regulators
2. Study of 79XX series regulators
3. Study of LM317 regulator
4. Study of a stable multivibrator using IC 555
5. Study of monostable multivibrator using IC 555
6. Study of linear ramp generator using IC 555
7. Frequency divider using IC 555.

Reference Books

1. Principles of Electronics, V. K. Mehta, Rohit Mehta
2. Functional Circuits in Electronics, S. G. Pimpale, Sushama Pimpale, Mcmillan India Ltd.
3. Elements of electronics M.K. Bagde, S.P. Singh, Kamal Singh, S.Chand

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4. Op-Amp and Linear Circuits, Gaikwad, PHI
 5. Electronic Instrumentation, Khedkar
 6. Basic Electronics and Linear Cicuits, Bhargava, Kulshreshtha, Gupta, Technical education series
 7. Electronic Devices & Circuits I& II, A. P. Godse, U. P. Bakshi Technical Publishers, Pune.
 8. Analogue and Digital technique, Navneeth, Kale. Gokhale,
 9. Instrumentation devices and circuits, Rangan, Mani, Sharma
 10. Linear Integrated Circuit by D. Roy Chaudhary
 11. Op-Amps and Linear Integrated Circuits by Ramakant Gaikwad

Web Resources

1. Students are advised to make use of the resources available on the internet. Some useful links related to electronics are given below.
2. M.I.T. open course ware video lectures are available at <http://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/VideoLectures/index.htm>
3. www.electronics-tutorials.com
4. www.science-ebooks.com/electronics
5. <http://computer.howstuffworks.com>
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. <http://101science.com/eleclinks.htm>
8. www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
9. www.discovercircuits.com/resources/tutorials.html

Shiksha Mandal's
Bajaj College of Science, Wardha
(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SYLLABUS FOR B.Sc. (ELECTRONICS) PART II
For Vocational Skill Enhancement Courses

*(Approved in BoS Meeting held on 11.03.2025 to be implemented from the academic
Session 2025-26)*

B.Sc. PART II - SEMESTER III

Vocational Skill Course (VSC)

Course Name: **Fundamentals of Soldering and PCB Designing**

Course Code: **UEL232P**

Credits: 2 (4Pr)

No. of Practical Hrs: 60

Course Description:

Electronic circuits have become the essential part of everyone's life these days. Soldering and PCB design are the most important integral part of every electronic circuit. Therefore, such skill needs to be developed among the students which may lead to self-employment or even creates opportunities for others too. This course will be helpful to develop these skills among the students.

Learning Objectives:

1. To understand the fundamentals of soldering and its tools
2. To learn to perform soldering of electronic components
3. To develop skill s of PCB design

Course Learning Outcomes:

On completion of this course, learner will be able to

1. Select proper tools for soldering
2. Perform soldering of various electronic components
3. Rectify the errors in soldering
4. Use KiCad Editor (Free Open-Source Software for PCB Design)
5. Design simple PCBs as per the schematic design

Unit-I: Soldering Fundamentals What Is Soldering? Other Types of Soldering, The Difference Between Soldering and Welding, Soldering Electronics Basic Soldering Tools and Material: What Soldering Iron Should You Purchase? Soldering Iron Accessories Getting a Grip on Your Work, Summary of Tools, Materials, Preparing Your Soldering Iron and Workstation, Soldering Printed Circuit Boards (PCBs), Trimming the Wire Leads after a Successful Soldering Connection, Connecting Wires or Components Without a PCB.

Unit-II: Troubleshooting and Fixing Mistakes Common Mistakes, Different Ways to Remove Solder, Repairing Lifted Pads. Advanced Soldering: Tools, Materials, How to Solder Simple Surface-Mount Devices, How to Solder a Multi-lead SMD, When Something Goes Wrong—Fixing and Removing Components.

Unit-III: Fundamentals of PCB Design Fundamental of basic electronics, Component identification, Component symbols & their footprints, Understand schematic. Introduction to the KiCad PCB Editor, PCB Editor user interface, Navigating the editing canvas, Hotkeys, Display and selection controls, Creating a PCB, Basic PCB concepts, Board setup Editing a board, Placement and drawing operations, Snapping, Working with footprints, Working with pads, Working with zones, Graphical objects Dimensions, Routing tracks Forward and back annotation Importing graphics Inspecting a

board, Generating outputs, Additional fabrication outputs Printing Exporting files Footprints and footprint libraries. PCB processing

List of Practical:

1. Soldering Practice Board
2. Soldering Iron Temperature Control
3. Soldering Iron Tip Maintenance
4. Soldering Iron Tip Replacement
5. Through-Hole Soldering Practice
6. Surface Mount Soldering Practice
7. PCB Design Practice

References:

1. Make: Getting Started with soldering by Marc de Vinck
2. <https://www.kicad.org/>

B.Sc. PART II - SEMESTER III
Skill Enhancement Course (SEC)
Course Name: **OFFICE AUTOMATION**
Course Code: **UEL233P**

Credits: 2 (4 Pr)

No. of Practical Hrs.: 60

Course Description:

This course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools.

Learning Objectives:

To familiarize the students in preparation of documents and presentations with office automation tools.

Course Learning Outcomes:

After completion of this course the students would be able:

To work in office, handle documents, spreadsheets, make presentations and communicate through internet.

UNIT I: Introduction, basics, starting Word, creating document, parts of Word window, mouse and keyboard operations, designing a document; Formatting- selection, cut, copy, paste; Toolbars, operating on text; Printing, saving, opening, closing of document; Creating a template; Tables, borders, pictures, text box operations; Mail Merge.

UNIT II: Introduction to MS EXCEL, navigating, Excel toolbars and operations, Formatting; copying data between worksheets; entering formula, chart creation; data forms, data sort; Functions in Excel ROUND(), SQRT (), MAX(), MIN(), AVERAGE(), COUNT(), SUMIF(), SUMIF(), ABS(), ROMAN(), UPPER(), LOWER(), CELL(), TODAY(), NOW().Charts in Excel, Sorting, Searching, and Filtering data.

UNIT III: Introduction to MS POWER POINT Working with Power Point Window, Standard Tool Bar, Formatting tool bar, Drawing tool Bar, Moving the Frame, Inserting Clip Art, Picture, Slide, Text Styling, Send to back, Entering data to graph, Organization Chart, Table, Design template, Master Slide, Animation Setting, Saving and Presentation, auto Content Wizard.

List of Practical:

1. To Prepare a Resume/Official Letter / Business Letter / Circular Letter Covering formatting commands - font size and styles - bold, underline, upper case, lower case, superscript, subscript, indenting paragraphs, spacing between lines and characters, tab settings etc.
2. To create a table using table menu, using cell editing operations like inserting, joining, deleting, splitting and merging cells.
3. To create numbered list and bulleted list with different formats (with numbers, alphabets, roman letters).
4. To use mail merge facility for sending a circular letter to many persons.
5. To Prepare a Statement for preparing Result of 10 students in 5 subjects (using formula to get Distinction, I Class, II Class and Fail under Result column against each student).
6. To perform operations like finding, deleting and adding records, formatting columns, row height, merging, splitting columns etc. Connecting the Worksheets and enter the data.
7. To create a chart for comparing the monthly sales of a company in different branch offices.
8. To perform Sorting, Searching operations, and Filtering Data.
9. To create a new Presentation based on a template – using Auto content wizard, design template and Plain blank presentation.
10. Creating a Presentation with Slide Transition – Automatic and Manual with different effects.
11. Creating a Presentation applying Custom Animation effects – Applying multiple effects to the same object and changing to a different effect and removing effects.
12. Creating and Printing handouts.

Reference Books

1. MS Office XP for Everyone By Sanjay Saxena (Vikas Publi, Noida)
2. MS-Office 2000(for Windows) By Steve Sagman
3. A First Course in Computers – Sanjay Saxena