1) **Title of the course:** Second Year B.Sc. Electronic Science

2) **Introduction:** Semester Pattern is followed at S.Y.B.Sc. Electronic Science. Second year B.Sc. syllabus is desired to provide core technical skills in design, analysis, building and testing electronic blocks/circuits. Training on equipment handling and maintenance is also included. In the theory courses adequate knowledge of Analog circuit design, digital circuit design, communication systems and electronic circuit measurement and testing instrumentation knowledge will be acquired by the students. Student taking admission at S.Y.B.Sc. Electronic Science have to complete 4 theory courses two each semester and one practical course (Annual). In the practical course of 100 marks there are compulsory experiments along with the activities to be done. There are two types of activities – One carried out by the student in his own area of interest and other to be arranged by teachers for enhancement of the practical quality and skills of the students.

3) **Aim and Objectives :**

   The aim of the course is to generate the manpower with adequate theory knowledge of the electronic circuit design, instrumentations and practical work along with hands on experiences of the practical work.

   Following are the objectives –

   i) To design the syllabus with specific focus on key Learning Areas.
   ii) To equip student with necessary fundamental concepts and knowledge base.
   iii) To develop specific practical skills.
   iv) To impart training on circuit design, analysis, building and testing.
   v) To prepare students for demonstrating the acquired knowledge.
   vi) To encourage student to develop skills for accepting challenges of upcoming technological advancements.

   These objectives can be achieved by implementing this syllabus at the second year B.Sc. Electronic Science. Also it will provide foundation for the T.Y.B.Sc. Electronic Science course.

4) **Eligibility:** First Year B.Sc. Pass / ATKT.

5) **Examination –**

   A) **Pattern of Examination :**

   i) **Semester and Practical**

      **Theory Papers** - Two Theory papers of 50 marks per semester
      (Internal examination 10 + Semester Examination 40, Total 50)

      **Practical** - At the end of year 100 marks Examination.
      (Internal examination 20 + Semester Examination 80, Total 100)
ii) Pattern of the question Paper:
The pattern adopted for theory and practical examination is as below.

**Theory:**
The topic wise weightage is decided as per lecture allotted to cover the syllabus for the topics. The Internal option is also taken into consideration in the process. Equal weightage is given for each topic, and none of the topic can be put up as option by the student for examination.

**Internal Examination 10 Marks**
Four types of questions – Objective, Fill in the blanks, True or False and One sentence answer.

There are two or three different sets of the question papers used for internal examination in the same class for same paper.

It is continues evaluation process and is executed by the teacher conducting the course.

**External Examination 40 Marks**

Pattern is as follows-

Q.1 Answer any all of the following : 12 marks
- Compulsory no internal option, contains one mark, two mark objective and numerical questions.

Q.2 Answer any TWO. : 08 marks
- Three questions are given, each having 4 marks, any two are to be solved.

Q.3 Answer any TWO. : 08 marks
- Three questions are given, each having 4 marks, any two are to be solved.

Q.4 Answer any TWO. : 12 marks
- Three questions are given, each having 6 marks, any two are to be solved.
- There is complete option question for Q.4 having three compulsory numerical problems having weightage of 4 marks each.

**Practical:**
- Internal Marks 20 : Continuous assessment
- External Examination 80 Marks. – Have to perform 2 experiments of 40 marks of the duration 3 hours each. (Practical Examination is scheduled in two sessions.)

**B) Standard of passing:**
Candidate must score 40% marks at the semester examination in each course. i.e. **16 marks at semester theory paper 32 marks at the practical course**

There is no separate passing for internal course, however the total marks of internal and external should cross 40% of the total marks to be awarded.

**C) ATKT Rules:**
As per University statues

**D) Award of Class:**
Overall class including the subjects offered by the candidate at Second Year B.Sc. Electronic Science. It will as per University rules as –
- Above 70% First class with distinction
- Between 60% to 70% First Class
- Between 50% to 60% Second Class
- From 40% to 50% Pass class.
However the marks in the electronic science papers at Second Year B.Sc. course will be taken into account, at T.Y.B.Sc. for awarding the ultimate class of the course.

E) External Students: Not applicable for this course. External Students are not admitted for the course.

F) Setting of Questions paper/ Pattern of Question paper:
Setting of the question paper is as per University Schedule and it is centralized system adopted by University of Pune. Pattern of question paper will be as per decided by Board of Electronic Science, University of Pune.

G) Verification of Revaluation: As per University Statutes and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Structure of the course:
   i) Compulsory Paper       : Four theory papers
   b) Optional Paper              : Nil
   c) Question paper             : Theory -
                                   For Internal Examination 10 Marks
                                   For Semester Examination 40 Marks
                                   Practical “
                                   For Internal Examination 20 Marks
                                   For Semester Examination 80 Marks
   ii) Medium and Instructions: ENGLISH

7) Equivalence subject/Paper and Transitory Provision:

<table>
<thead>
<tr>
<th>Semester</th>
<th>OLD Syllabus</th>
<th>New Syllabus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester I</td>
<td>EL211 Analog Circuit Design Principles I</td>
<td>Paper - I: Analog Circuits and Systems</td>
</tr>
<tr>
<td></td>
<td>EL 212 Communication I</td>
<td>Paper - II: Electronic Instrumentation</td>
</tr>
<tr>
<td>Semester II</td>
<td>EL 221 Analog Circuit Design Principles II</td>
<td>Paper – I: Digital System Design</td>
</tr>
<tr>
<td></td>
<td>EL 222 Communication II</td>
<td>Paper – II: Communications System</td>
</tr>
</tbody>
</table>

8) University Terms: More than 75% attendance is necessary for the course as per University statues.
16 Weeks will be available for completion of theory course.
Practical course will be throughout the year.

9) Subject wise Detail Syllabus and Recommended books:
UNIT 1: Amplifiers: (12)

UNIT 2: Power Amplifiers (12)
Comparison of small signal and large signal amplifiers: with respect to gain, efficiency, and distortion. Classification of power amplifiers on the basis of conduction: class-A, class-B, class-AB, class-C, class D, Class E. Class-A amplifier: resistive load/transformer coupled load, efficiency calculation of transformer coupled amplifier, comparison for efficiency, concept of harmonic distortion. Class B amplifier: Efficiency calculation, Push-pull amplifier concept, complimentary symmetry class-B push pull amplifier, crossover distortion, class AB push pull amplifier. Concept, use and types of heat sinks.

UNIT 3: Feedback (08)

UNIT 4: Differential Amplifiers (06)

UNIT 5: Opamp and its applications (10)

Recommended Books:

<table>
<thead>
<tr>
<th></th>
<th>Author</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malvino A.P.</td>
<td>Electronic Principles</td>
<td>TMH</td>
</tr>
<tr>
<td>2</td>
<td>Gaykawad R.</td>
<td>Operational amplifiers and linear Integrated Circuits</td>
<td>PHP</td>
</tr>
<tr>
<td>3</td>
<td>Clayton G.B.</td>
<td>Operational amplifier</td>
<td>ELBS</td>
</tr>
<tr>
<td>4</td>
<td>Millman, Halkias</td>
<td>Electronic devices and circuits</td>
<td>McGrawHill</td>
</tr>
<tr>
<td>5</td>
<td>Boylestead</td>
<td>Electronic devices and circuits</td>
<td>PHP</td>
</tr>
<tr>
<td>6</td>
<td>Meheta V.K.</td>
<td>Principles of Electronics</td>
<td>S.Chand and Company</td>
</tr>
</tbody>
</table>
S.Y.B.Sc. Electronic Science - Semester I
Paper - II: Electronic Instrumentation

**Unit 1: Measurement principles**  (04)
Measurement of physical parameters, measurement system block diagram. Measurement characteristics like accuracy, precision, Sensitivity, linearity, resolution, reliability, repeatability, errors.

**Unit 2: Test and Measuring instruments**  (18)

**Unit 3: Signal Sources**  (06)
Working principle, block diagram, specification and operating procedure for: Signal and function generators, Sweep generator.

**Unit 4: Power Supplies**  (10)
Working principle, block diagram, specification and operating procedure for: Fixed voltage power supply, variable power supply, dual power supply, CVCC power supply, SMPS, DC to DC converter, UPS.

**Unit 5: Special measurement systems**  (10)
Working principle, block diagram, specification and operating procedure for: Digital Thermometer, Lux meter, Tachometer, Speedometer, pH meter.

**Recommended Books:**

<table>
<thead>
<tr>
<th></th>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Modern Electronic Instrumentation and measurement techniques</td>
<td>Helfrik A.&amp; Cooper W.</td>
<td>PHI</td>
</tr>
<tr>
<td>2</td>
<td>Instrumentation Devices &amp; Systems</td>
<td>Rangan, Mani, Sharma</td>
<td>TMH</td>
</tr>
<tr>
<td>3</td>
<td>Power Electronics</td>
<td>Rashid Muhammad H</td>
<td>PHI</td>
</tr>
<tr>
<td>4</td>
<td>A course in electrical and electronic measurements and instrumentation</td>
<td>Sawhney A.K.</td>
<td>Dhanpat Rai &amp; Company</td>
</tr>
<tr>
<td>5</td>
<td>Power Supplies</td>
<td>B.S. Sonde</td>
<td>TMH</td>
</tr>
<tr>
<td>6</td>
<td>Electronic Instrumentation</td>
<td>Kalasi H. S.</td>
<td>TMH</td>
</tr>
<tr>
<td>7</td>
<td>Digital Instrumentations</td>
<td>Bouwens</td>
<td>TMH</td>
</tr>
</tbody>
</table>
UNIT 1: Combinational circuits (12)
Design of code converter: BCD to 7 segments, Binary/ BCD to Gray, Gray to Binary / BCD, serial adder, 4-input priority encoder, parity generator, 4-bit magnitude comparator.

UNIT 2: Sequential circuits (10)

UNIT 3: Compatibility in digital systems (08)
Fan in Fan Out, Totem pole, Open collector outputs, Tristate Logic, Current Booster, Buffer, Latches, Unidirectional and Bidirectional BUS concepts. TTL and CMOS Logic converters.

UNIT 4: Data Converters (10)
Key Features, Advantages and applications of Digital to Analog Converters: Weighted resistive network and R-2R ladder type. Key Features, Advantages and Applications Specific selection of Analog to Digital Converters: Staircase, Ramp Type, Single Slope and dual slope, Servo Type, Successive approximation and Flash type.

UNIT 5: Digital System Interfacing and Applications (08)
Digital system interfacing of LEDs and Multidigit Seven segment LED display Driver. Interfacing of a switch and switch matrix, Thumb Wheel Switches. Interface considerations for ADC / DAC with digital systems. Applications of counters: Digital clock, Auto-parking system, totalizers. Applications of shift registers: time delay generator, parallel to serial converter, serial to parallel converter, UART and serial Keyboard encoder

Recommended Books:

<table>
<thead>
<tr>
<th></th>
<th>Authors</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Floyd Thomas L</td>
<td>Digital Fundamentals</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>2</td>
<td>Raj kamal</td>
<td>Digital System Principles and Design</td>
<td>Wheeler</td>
</tr>
<tr>
<td>3</td>
<td>Moriss Mano</td>
<td>Digital Circuit Design</td>
<td>PHP</td>
</tr>
<tr>
<td>4</td>
<td>Malvino Leach</td>
<td>Digital Principles and Applications</td>
<td>TMH</td>
</tr>
<tr>
<td>5</td>
<td>Strangio</td>
<td>Digital Electronics</td>
<td>TMH</td>
</tr>
<tr>
<td>6</td>
<td>Floyd, Jain</td>
<td>Digital Fundamentals</td>
<td>TMH</td>
</tr>
<tr>
<td>7</td>
<td>Anand Kumar A.</td>
<td>Switching Theory and Logic design</td>
<td>PHI</td>
</tr>
</tbody>
</table>
S.Y.B.Sc. Electronic Science  Semester II
Paper – II: Communications system

1. **Basics of communication systems.**

2. **Transmission Media**
   Principle, types and applications of - Free space communication using Radio waves and Microwaves, Cable communication using Twisted Pair, Coaxial cable, Fiber Optic Cable.

3. **Radio and Television communication**
   Block diagram of AM (TRF and Superhetrodyne) and FM radio receiver, Receiver characteristics. Elements of TV broadcasting system: scanning, synchronization, composite video signal, audio/video channels. Block diagram of Television receiver, Basic principles of Monochrome and Colour TV, CCTV.

4. **Telecommunication Systems**
   Block diagram of a Telephone handset, principles of Pulse and DTMF dialing, concepts of call routing, PSTN and cellular telephony. Digital communication systems: Block diagram, MODEM, concept of ASK, FSK, PSK.

5. **Modern Communication Systems**
   Basic principles and functioning of: mobile phone, FAX , Set Top box and Dish TV, Internet and its applications, e-commerce, e-banking, e-learning, ATM Machines.

**Recommended Books:**

<table>
<thead>
<tr>
<th></th>
<th>Author</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kennedy</td>
<td>Electronic Communication, 2nd edition</td>
<td>TMH</td>
</tr>
<tr>
<td>2</td>
<td>Frenzel</td>
<td>Communication Electronics, 3rd edition</td>
<td>TMH</td>
</tr>
<tr>
<td>3</td>
<td>Dennis Roddy, John Coolen</td>
<td>Electronic Communication System</td>
<td>PHI</td>
</tr>
<tr>
<td>4</td>
<td>Grob B.</td>
<td>Electronic Principles</td>
<td>TMH</td>
</tr>
<tr>
<td>5</td>
<td>Vishwanathan Thiagarajan</td>
<td>Telecommunication Switching Systems and Networks</td>
<td>PHI</td>
</tr>
</tbody>
</table>
S.Y.B.Sc. Electronic Science
Practical Course

- Total Practical to be conducted 20.
- 16 experiments compulsory: At least four practical from each of the ABCD groups.
- One activity equivalent to 2 experiments by the student.
  a. Continuation of F. Y. activity.
  b. PSPICE Simulation
  c. Documentation type experiments
  d. Presentation/Seminar on Electronics /advanced topic/research topics.
- One activity equivalent to 2 experiments to be arranged by the teacher – Arrange at least two practical demonstrations / Workshops which will enhance quality and skills of the student.
- Examination will be conducted on 16 experiments as well as on activities.

**Practical Examination –**

A) Internal Marks 20: 16 Marks
   as usual for 16 marks for experiments and 04 marks for activities

B) Annual examination: 80 Marks in Two session of 3 Hrs as usual practice.

<table>
<thead>
<tr>
<th>Session I</th>
<th>40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical work</td>
<td>32 marks</td>
</tr>
<tr>
<td>Oral based on the student’s own activities</td>
<td>8 marks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session II</th>
<th>40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical work</td>
<td>32 marks</td>
</tr>
<tr>
<td>Oral based on Common activities arranged by teachers</td>
<td>8 marks</td>
</tr>
</tbody>
</table>

32 Marks can be divided as -

- Circuit diagram: 05
- Connection: 05
- Demonstration and working explanation: 10
- Results: 05
- Result analysis / conclusion / comments: 02
LIST OF PRACTICALS:

Group A: Analog circuit design
2. Design and test two stage amplifier. OR Study of effect of negative feedback on frequency response and gain of amplifier.
3. Design and test FET amplifier.
4. Design and testing of Wien bridge/phase shift oscillator.
5. Design and testing of 3 opamp instrumentation amplifier OR Programmable gain amplifier.
6. Design and test First order butterworth active filter (low pass and high pass) OR Design and test V to I converter. (High current and low current).

Group B: Digital circuit design
1. Study of ADC / DAC parameters.
2. Design of counter for given count sequence.
4. Design and test Event Counter.
5. Design and testing of 4-bit Parallel Adder.
7. Xilinx Simulation on schematic level.

Group C: Communication
1. Design and testing of AM using IC (AD 633) / transistor and detector.
2. Design and testing of FSK modulation.
3. Design and testing of TDM at least four channels.
4. Design and testing of RF Tuned amplifier.
5. Study of PPM, PWM and PAM.

Group D: Instrumentation
1. Design of resistive ladder for multirange voltmeter.
2. Design of bridge amplifier for temperature measurement system using thermister/RTD/PT100.
3. Study of DFM for various modes/ Function Generator.
4. Study of CVCC power supply/ variable power supply.
6. Study of UPS/SMPS.